Refrigeration Service Engineer

VOL. 13 NO. 11 NOVEMBER . 1945

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DRYING GAS CHARGED EXPANSION VALVES

No. 6 of a Series

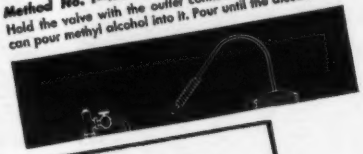
Moisture in a refrigeration system often accumulates in the expansion valves causing freeze ups which put the system out of operation.

After the system is thoroughly dried, it may be necessary or desirable to disconnect the expansion valve and dry it separately. Moisture may so permeate the valve as to make it impossible to dry it by ordinary means.

Detailed here are four effective methods of drying "Detroit" Gas Charged Expansion Valves No. 673 and 674; 893 and 894; 896 and 897; 899, 786, 787 and 788. Procedures for drying other type "Detroit" valves will be taken up in subsequent data sheets.

Method No. 1—Methyl Alcohol and Refrigerant

Hold the valve with the outlet connection upright so you can pour methyl alcohol into it. Pour until the alcohol runs



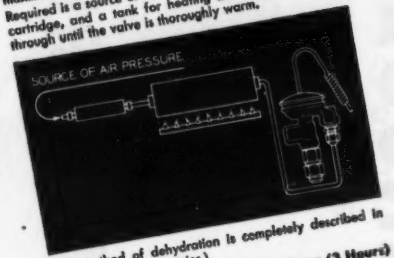
a. "Detroit" Gas Charged Valves having maximum pressures of 20 psi or less can be dehydrated at 220°F.

b. "Detroit" Gas Charged Valves having maximum pressures greater than 20 psi can be dehydrated at 160°F.

Bake for 3 hours, making sure temperature does not rise above indicated limit. Install or cap as soon as the valve can be handled to avoid entry of moisture from the air.

Method No. 3—Heated Dry Air (30 Minutes)

All "Detroit" Gas Charged Valves may be dehydrated by this method. Air temperature should be limited to 160°F maximum. Pressure on valve should not exceed 50 psi. Required is a source of air under pressure, a dehydrating cartridge, and a tank for heating the air. Blow hot air through until the valve is thoroughly warm.



(This method of dehydration is completely described in Sheet No. 4 of this series.)

Method No. 4—Heat and Vacuum Oven (3 Hours)

Required is a temperature regulated oven, strong and tight enough to hold a vacuum of 26" to 27" mercury without collapsing or leaking air, and a good vacuum pump.

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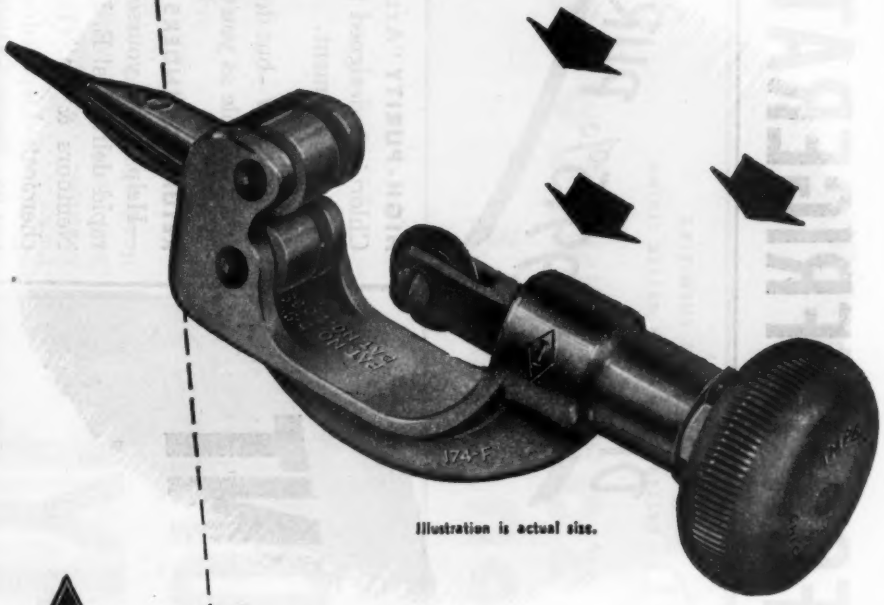

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You'll be delighted with the way this cutter makes clean, right angle cuts—so essential to good tubing work. Tubing rests against sturdy rollers making operation easy and preventing galling or rubbing. Special flare cut-off groove in the rollers makes it possible to remove damaged flares without waste. This often eliminates the need for replacing a whole length of tubing. Note handy reamer for removing burrs.

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Acid (as HCl) . . . 0.001% by wgt. max.
Residue on Evaporation
0.01% by wgt. max.
Boiling Range(760mm)
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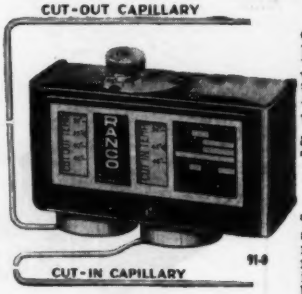
Color . . . . . water white, clear

A MAN IS KNOWN BY THE COMPANY HE KEEPS . . .

Ranco Controls, used for replacements, have kept many refrigerators running during the past four years. The work of service men in the industry can never be properly evaluated and compensated. But this work will pay dividends in the years ahead, because more and more individuals have learned about Ranco Controls at first hand, and they know their accuracy and dependability.



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Ranco Inc.

COLUMBUS 1, OHIO

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Business - opportunity Picture!

Old condensing units to be replaced with modern, efficient ones... new applications for refrigeration in business establishments and industrial plants. There's plenty of business in sight for refrigeration service engineers as new equipment becomes available!

Here's a tip on how to get *your* share of this business: recommend *G-E* Condensing Units for both new and replacement jobs.

Your customers know what the G-E reputation means . . . they'll be ready to accept your recommendation! And *you* know that G-E Condensing Units give the dependable, long-life performance, the efficient operation that assure customer satisfaction and build repeat business. For postwar profit opportunities, TURN TO G.E.!

* * *

General Electric Company, Air Conditioning Department, Section 57111, Bloomfield, N. J.

BUY...and hold...VICTORY BONDS

GENERAL ELECTRIC

IN THIS ISSUE—

The fourth guest editorial appearing on page 21 by W. A. Matheson lauds the service engineer for the remarkable job he has done during the war, outlines the vast potential market for refrigeration in the future and the possibilities open to the serviceman who really wants to sell. Mr. Matheson points out that perhaps the serviceman does not want to sell, but if he does, his efforts during the past few years put him in first place to get the sales of tomorrow.

The third article in the series on Airtemp Air Conditioners appears on page 23. Adjustment procedure, charging with oil and refrigerant and final inspections are some of the subjects discussed.

George Holman discusses the relation of humidity to practical refrigeration on page 29, pointing out the many harmful effects of moisture on the installation. The effects of moisture however can often be used to indicate the operating conditions of the system according to Mr. Holman.

W. E. Patten registers a complaint on the method used by some manufacturers to fasten motor pulleys and offers corrective suggestions. See page 33.

Refrigerants—their physical and refrigerating properties by Guy R. King on page 35 offers a thorough analysis of many refrigerants commonly used in the field today.

Another aid to the service engineer starting his own service business is offered on page 42 under the heading "Determining the Rate of Service Charge." This is a theoretical analysis of principal hourly costs, but is helpful in getting a start.

Under the Commercial Selling Department starting on page 43 are two helpful sales ideas for the service company, and a warning by Harry Boyd Brown to those who may be underestimating the value of, or immediate need for salesmen.

A new Column entitled The Dispatcher appears on page 88. It contains personals and news of service companies.

THE COVER

AN IMPORTANT factor in testing Pratt & Whitney aircraft engines in the Chevrolet aviation engine plant, Tonawanda, N. Y. is the proper control of the temperatures of engine lubricating oil and the volume of air that passes through the huge test cells during the three stages of the regular production tests.

To assure proper temperature of the air during hot weather and correct temperature of oil in all weather, a refrigerating plant which has a rated capacity of 2,000 tons of ice every 24 hours is in operation the year 'round, attaining peak output during the summer months.

If this refrigerating plant were to operate steadily at its rated capacity and its output was transformed into natural ice, it would provide an amount sufficient to supply a city the size of Cleveland. As a matter of fact, however, the plant never produces ice. It produces chilled water at a temperature of about 40° F.

The refrigerating plant is operated regularly in conjunction with a heating plant. The combination keeps engine oil at the proper temperature for best results in testing operations. For example, when engines are run at less than 1200 r.p.m. during the first stage of the test, the oil, which must go in at 161 to 167° F. normally, would come out at about 150° F. or 11 to 17 degrees lower than when it entered the engines. The heater brings the oil back up to the desired temperature during this part of the test. But, during later stages of the test when engine speeds range from 1500 to more than 2000 r.p.m., oil temperatures rise proportionately. The refrigerant then is used to cool the oil down to specified temperatures. The heating and cooling of the oil is automatically controlled.

The capacity of the refrigerating plant is taxed heaviest during hot weather, when air on the roof of the plant, where it enters the test cells, in volume exceeding 16,000 pounds, may be at a temperature of 100 or more degrees F., and must be brought down to about 80° F., in order to have the density necessary for best test purposes.

Each month an executive of a well known refrigeration organization will address the readers of The Refrigeration Service Engineer on a subject of timely interest.

This Month's GUEST EDITOR

W. A. MATHESON, *Vice President*

EUREKA VACUUM CLEANER CO.
and Manager, WILLIAMS OIL-O-MATIC DIV.

The Opportunity of Sales Through Service

CENTURIES ago, man learned that such makeshift cooling agents as snow or natural ice would make food and drink more palatable. Then came such later developments as the old oaken bucket in the well, the cool corner in the basement, and the window box with its strictly seasonal usage. What a far cry to refrigeration of today with its more than 200 essential services.

Refrigeration today is part and parcel of our daily lives. In fact one authority estimates that at least 77 per cent of the food eaten by the average American family involves the use of refrigeration or air conditioning, or both, for processing, preserving, or distributing. Seventy-seven per cent of the food going into American homes depends on mechanical cooling for its quality, flavor, and wholesomeness.

Let's digress for a moment, though, and take a look at some of the exciting assignments of refrigeration at war. The refrigeration service field can be proud of the fact that refrigeration did go to war! That refrigeration equipment went to war! That refrigeration service "know-how" went to war.

In the average battleship it is estimated that around 10,000 pounds of food are consumed each day. Half of this food is kept under constant refrigeration from the time the ship leaves port until the food is eaten.

In the hot places of Asia, refrigeration was regarded with such importance that the Army called on elephant help to transport big units so that troops could have proper food.

We should never lose sight of the fact that heat and the jungle and the tropics were also our deadly enemies. Never in history has a fighting force from a temperate climate waged so successful a war under the conditions encountered by our men throughout the Pacific, in the Middle East, and in China. Successful because properly preserved foods were on the job everywhere.

For instance, the Army developed floating cold storage "warehouses"—ships built at a cost of one million two hundred thousand dollars each. Eight main holds stored the equivalent of 64 carloads of frozen meats at 12 degrees Fahrenheit. Two additional main deck compartments with a capacity of one thousand tons preserved fresh vegetables, cheese, butter and eggs. Eighty-four electric motors of 150 hp maintained the condensing units.

That's an example of big scale refrigeration. But mechanically refrigerated portable containers—many of them as small as 25 cubic feet—were widely used to supply fresh meat and other foodstuffs to troops in widely scattered, often nearly inaccessible regions.

Raiding the refrigerator is something with which we are all familiar. But it remained for the Navy to put refrigerator raiding on a gigantic scale. Imagine a one-story plant in the heart of the tropics, capable of storing

5 and a half million pounds of foodstuffs at just the right degree of cold, despite 130-degree heat outside.

Capacity of this big Southwest Pacific refrigerator, as reported to the Refrigeration Equipment Manufacturers Association by the Navy is: 2½ million pounds of meat, 2,200,000 pounds of fruits and vegetables, and 800 thousand pounds of dairy products. A big portion of the Pacific fleet was supplied with properly refrigerated foods from this huge plant. And that is refrigerator raiding on a Navy scale!

Refrigeration at War

So far, we've discussed refrigeration at war from the sole standpoint of food preservation. But refrigeration equipment took on other jobs—equally big, equally important. For instance, the Army Air Force operated what has been called the "world's largest refrigerator" at Wright field. It is a complete building with 50 thousand cubic feet of "cold space"—more than 7 thousand times larger than the average household refrigerator of 7 cubic feet. Windows eight panes of glass thick, helped keep the temperature as low as 95 degrees below zero for all manner of tests on planes built to fly at high altitudes.

No reference to refrigeration at war would be complete without grateful mention of the part played by refrigeration in the production of penicillin, blood plasma, and whole blood. Forget the mechanical phase of these particular refrigeration assignments, for the moment. Think only of the thousands and thousands of lives saved by penicillin, blood plasma, and whole blood.

What I like most about the countless achievements of refrigeration at war (space permits mention of only these few) is the fact that every wartime refrigeration development holds even greater promise in the peaceful days ahead. Few industries are in such a unique position.

Wartime industrial production also found new uses for refrigeration. In some cases, two to three hours of treatment at 120 degrees below zero have doubled the life of cutting tools.

Milling cutters subjected to a similar "freezing" process, have stood up under 24 hours of service instead of seven; hacksaw blades have lasted up to 119 per cent longer, and drills have cut more than 250 holes instead of 50 before re-sharpening.

Life of welding tips has been lengthened greatly by the use of "cold" welding in which water chilled by mechanical refrigeration is supplied to intensely hot welding tips so that a worker can make as many as 800 welds with one tip instead of 30 to 40 before it is necessary to clean or change the tip.

In atomic bomb development, too, refrigeration was important, though details of its use have not yet been disclosed.

Up to this point we've talked about all of these new assignments of wartime refrigeration. Quite naturally, these new assignments required new equipment. New equipment that would ordinarily have gone into regular consumer channels went to the Armed Forces and wartime industry—while every refrigeration service man throughout the country accepted the tremendous responsibility of keeping the old equipment running.

During a war, few words hold such ominous threats as sobotage and saboteur. We think af trains wrecked, war plants blown up, power plants paralyzed. For just a minute, let your imaginations go. Imagine, if you will, what would have happened if some enemy power had hit upon a powerful ray that could have stopped every refrigeration compressor in the country for even 24 hours. Think of it! What a picture that suggests! Such a catastrophe would have scuttled the rationing system and you can well imagine the chaos and confusion that would have brought on. Refrigeration and red points have more in common than is at first apparent.

More Calls—Fewer Men

But the Nation's refrigerators did not stop. The ingenuity and "know-how" of the service men kept them running. You kept them running as parts became harder and harder to get, as individual service men handled an increasing number of calls.

In New York City, for instance, a 1941 survey showed that a certain number of contractors had employed 253 men who made 376,000 calls. In the same period in 1944, these same firms had but 182 service men available (many of them newly trained) to handle 456,000 calls. In brief: 80,000 more calls. 71 fewer men.

This meant that the average number of calls per day, per man, had jumped from five to nine—a high figure in New York City with its great distances and traffic jams. Every service man who went into the Armed Forces or a war plant, left at least 1500 calls per year to be handled by the remaining men. As the war years passed, the refrigeration service situation might well have been

summed up like this: Fewer and fewer did more and more! And for the magnificent job you did, an industry honors you.

During the war years, the priceless good will and the future of the refrigeration industry were in the hands of the service men —and you alone. There wasn't any new equipment to sell. So there weren't any salesmen out singing the praises of refrigeration. And, confidentially, I don't think that salesmen ever were quite the singers they imagined themselves. In your own quiet—perhaps non-musical way—you did one whale of a selling job during the war years.

Why do I say this? First, because of present users' confidence in mechanical refrigeration. Without such confidence nobody sells. Second, the sales goals set up by the refrigeration industry—based on this user confidence and a huge backlog built up by almost four years without new equipment.

The Future of Refrigeration

If you are interested in the future of the refrigeration industry from an installation and service or sales viewpoint, you will find the picture exciting and inspiring.

Back in June of this year, the War Production Board estimated that the public wanted to buy as many as 5,852,000 mechanical refrigerators as soon as possible. As of January 1, 1945, there were 19,792,000 mechanical refrigerators in American homes. Which means, as soon as possible, the industry could build and sell nearly one-fourth as many refrigerators as were sold in about 20 pre-war years. Quite a future, isn't it? But that's only the domestic side.

New needs and replacement needs in the commercial refrigeration and other fields deserve our attention. Until new equipment is available in volume to meet nationwide needs, present equipment must be repaired or expanded to handle additional loads. More than $70 million in new parts will be required to meet this need, alone.

Over half the refrigerating equipment used by the meat industry is 15 years old or more. Another huge market!

Nearly one-third of the half million water coolers now in operation are more than 10 years old. Such equipment is considered over age and in line for replacement, REMA reports. Pre-war output was approximately 50 thousand units a year, most of them self-contained rather than remotely controlled coolers. Demand for both types should boost postwar production to around 100 thousand units a year. Based on pre-war values, this water cooler business will represent a total expenditure of well over $10 million annually.

Before the war, it is reported, there were only a handful of packers of frozen foods. Today, there are 800, and some forecasts say that the number will reach 2,000 in the next few years.

Today, in addition, there is an immediate demand for one million home and farm frozen food units. A large percentage of this first million freezers will probably go into farm homes. It was the Nation's farmers who pioneered the use of home freezing units. These same farmers now have total reserves, available for buying consumer products of more than 12 billion dollars.

Electrified farms are expected to increase at least 50 per cent as a result of postwar programs of the Rural Electrification Administration and public utilities. Some 2,600,000 farm families now receive central station electric service.

Add up all of this evidence and the answer is a brilliant future in sales, and in service.

Does the Serviceman Want to Sell?

There is no chemical or biological difference between a salesman and service man. The successful salesman understands the needs of his prospect, is thoroughly acquainted with the means he has for supplying those needs, and is able to impress the prospect with his—the salesman's ability—to supply those needs. Or—worded another way—selling is the ability to transfer a series of favorable convictions about a product from the salesman's own mind to the mind of a prospective purchaser. Nothing mysterious about that, is there?

Who knows the needs of refrigeration prospects better than the service man? Who knows the ability of his refrigeration equipment better than the service man?

Of course this might be an opportune place to ask one question: "Does the service man really *want* to sell?" Whenever anyone with a sales background discusses the subject, he acquires a sort of Durante complex—"Everybody wants to get into the act!" So let's approach this from a safe angle: If you *want* to sell, refrigeration has the opportunity.

Previously I stated the service man knows the needs of the refrigeration prospect. From his own experience he knows the size cabinet that will mean a satisfied, happy user. You'd never catch a service man selling an under-sized cabinet to a pair of newlyweds. No sir! The service man looks ahead and sells a cabinet that will accommodate an

extra bottle of milk or two in about a year or so. The service man *knows* the needs of his prospects.

Salesman with a Conscience

One more observation. The service man turned salesman would stoutly resist the temptation to sell a smaller compressor than a job required, in order to cut his price and salvage a nearly-lost sale. You can bet on that one, because service men know all too well the headaches and grief that come from an overloaded compressor. Since the service man knows his product, he neither undersells nor oversells.

I don't know why I'm giving the service man's selling qualifications such a build-up. I don't know of any group that needs such a build-up less. As far as most of us are concerned, service men are salesmen. With this difference. The service man is a salesman with a conscience.

In the final analysis, there is only one conclusion. If refrigeration offers an opportunity in selling, it also offers an opportunity in service. Your place and future in refrigeration are a matter of personal choice and decision.

From either a sales or service viewpoint, the desirable characteristics of a product or industry are closely parallel.

Market, Acceptance, Demand

First, is there a market? In the face of the evidence discussed earlier, the only answer is "Yes!" There is a huge market for domestic refrigerators, for commercial equipment, for water coolers, for refrigerated coin machines, for frozen food cabinets, for milk cooling equipment. Impressive as they are, these classifications are, in a sense, the *prewar* refrigeration market. Remember that essential services performed by mechanical refrigeration have now passed the 200 mark —among them the application to industrial processes and the probability of permanent frozen blood banks in hospitals. There is a refrigeration market—and what a market!

Second, does the product have consumer acceptance? I'd certainly hate to dispute the acceptance of a product installed in 69.6 per cent of the Nation's wired homes. Yet, that's exactly what the 19,792,000 domestic refrigerators now installed represent.

Third, is there a demand? The best answer to this one, is the production goals of the industry. And you don't set up production goals by guesswork.

Refrigerator manufacturers who before the war had a total average production rate of 316,000 units monthly, expect to reach an output of 460,000 units a month by June of next year.

Such is the market, the acceptance, the demand which you kept in such faithful trust during the trying days of war. What field offers such bright promise for the service man who *wants* to sell? Whatever your choice—sales or service . . . an appreciative industry wishes you well.

* * *

APPLIANCES EXEMPTED FROM INVENTORY RESTRICTIONS

TEN major household appliances today were exempted from inventory restrictions of the War Production Board, to enable producers, wholesalers and retailers better to distribute consumers' goods which are scarce because they were not manufactured during the war years, WPB announced.

The action was taken by issuing Amendment 1 to Order L-63 and Direction 1 to Order L-219. Effective October 25, items included as exemptions in suppliers' inventories of supplies covered by Order L-63 and also in mercantile inventories of consumers' goods, as defined in Order L-219, are: mechanical refrigerators (L-63 had previously excluded this item from suppliers' inventory computations), gas and electric ranges, washing machines, electric mangles, electric water heaters, vacuum sweepers, sewing machines, radio receiving sets, phonographs and radio-phonograph combinations.

The high unit cost of the appliances is also a factor which contributed to the difficulties encountered by distributors and retailers, WPB said. Many merchants, whose total inventories are close to the overall dollar limits imposed by Orders L-63 and L-219, have expressed concern over their ability to avail themselves of increased manufacturers' allotments, even though such allotments are expected to remain relatively small until next year. Other merchants, dealing principally in major appliances, hesitated to make definite commitments to their suppliers, thus upsetting allotment schedules of manufacturers and impending equitable distribution of their product.

The exemptions announced today by WPB will answer many inquiries and satisfy appeals for relief currently received by WPB from merchants, officials said.

Installation and operation of (*Article Three*)

Airtemp Conditioners

ADJUSTMENT PROCEDURE

1. Remove the plug from the oil pressure gauge connection, 4, and the suction pressure gauge connection, 3, holding back on the externally threaded fittings so as to avoid loosening them.

Attach the oil pressure gauge (O-150 lbs.), to a gauge adapter shown in Fig. 6, and attach the gauge adapter to the externally threaded fitting, 4, with the stem, 4, Fig. 6, engaging the small plug inside the fitting. Make certain the opening, 5, on the gauge adapter is plugged. Then turn the hand wheel counterclockwise, which loosens the small plug inside the threaded fitting and permits the gauge to indicate the pressure.

Attach in the same manner a gauge adapter with a suction gauge (30" vacuum —90 lbs.) to 3.

Discharge Connections Differ

The discharge connection on the 3 hp. unit is located immediately below the cylinder cover plate on the base of the housing as shown in Fig. 2. All three valve connections on these units are the same.

On the 5 hp. units, the discharge pressure gauge connection is 2, and is not to be used as the suction and oil pressure gauge connections are. Instead of a plug in the externally threaded fitting, there is a seal cap over the fitting. The small plug inside the fitting also serves as a by-pass and is off its seat and should be left that way.

The discharge pressure gauge (0-300 lbs.) is attached to the fitting on both sizes as described for attaching the oil pressure gauge.

There will be a slight Freon leak around the inner plug while the seal cap is being removed and the gauge adapter attached, so this should be done as quickly as possible. THE ONLY TIME THE INNER PLUG IS SEATED is when it is necessary to test the unloader valve. To do this, stop the compressor. Seat the inner plug by turning the handle of the gauge adapter clockwise; loosen the gauge adapter to relieve the pressure on the gauge, then tighten the gauge adapter on the fitting and observe the gauge. If the gauge shows pressure (10-15 lbs.) it would indicate that the unloader valve is leaking; if not, the gauge will remain constant at zero pounds pressure.

Before restarting the compressor, the inner plug must be loosened four full turns.

2. Start the compressor and note the operating discharge pressure. It should be 125 lbs. and is regulated by increasing or decreasing the water supply. Open the water valve to reduce discharge pressure and vice versa.

This is the third of a series of articles published by permission of Airtemp Division, Chrysler Corporation on the package conditioners for stores and residences. Service instructions and detailed descriptions of the mechanical and electrical parts are presented for the benefit of those who are called on to service these units in the field.

3. Observe the oil pressure on the oil pressure gauge connected to 4. The oil pressure should be at least 20 lbs. above the suction pressure when the conditioner is in normal operation.

4. Remove the gauge adapter. To do this, turn the hand wheel, 2, Fig. 6, to the right. This seats the inner plug. Then take off the gauge adapter and replace the pipe thread plug, using a thread paste such as litharge and glycerine.

Important Note for the 5 hp. Unit—The inner plug in the Discharge Pressure Gauge Fitting, 2, is left off its seat, four full turns.

5. Test all connections for Freon leaks and correct any leaks found.

If a room thermostat is used, set the differential as thought best by the application engineer for that particular installation.

Tag all water valves and switch boxes "Airtemp Air Conditioner No. 1, No. 2, or No. 3," as the case may be, so these valves or fuses will not be used for other purposes.

Charging Freon

If a full charge is required it is advisable to charge through the charging connection built in the body of the liquid-shut-off valve, 20. To do this, turn the liquid valve counterclockwise as far as it will go. (This is a back-seating valve.) Remove the plug, 17. Attach a fitting and charging line. Upend the Freon drum with the valve resting on a bathroom scale or suspend the drum with an accurate spring balance scale. Note the weight of the drum. Purge the charging line. Turn the liquid valve stem clockwise as far as it will go. Start the compressor. Open the drum valve and charge. The full charge is 16 pounds and 18 pounds for the 3 hp. and 5 hp. units respectively. The Freon will be drawn up the liquid line. Watch the scale to estimate the charge.

The system can also be charged through the suction pressure gauge adapter. Remove the plug from the adapter body, attach the fitting and charging line. Turn the adapter hand wheel counterclockwise to open the port in the compressor. Crack the valve on the Freon drum and charge slowly.

Charging Oil

A full charge of oil is one gallon. Oil should never be added unless there is indication of a major oil leak. Too much oil reduces overall efficiency and an overcharge is to be avoided.

If it is thought necessary to charge oil, drain the crankcase and add 3 quarts, assuming that 1 quart will be held in other parts of the system.

Start the compressor, and note the oil pressure. It should be 20-30 pounds above suction pressure. If so, there is no need to add further oil. If the pressure, after adding, is below 20 pounds, then add carefully, through the suction gauge adapter, 1 pint. If this brings the oil pressure to normal, add no more. Never charge more than a total of one gallon. Use only Airtemp Freon oil, available through Airtemp.

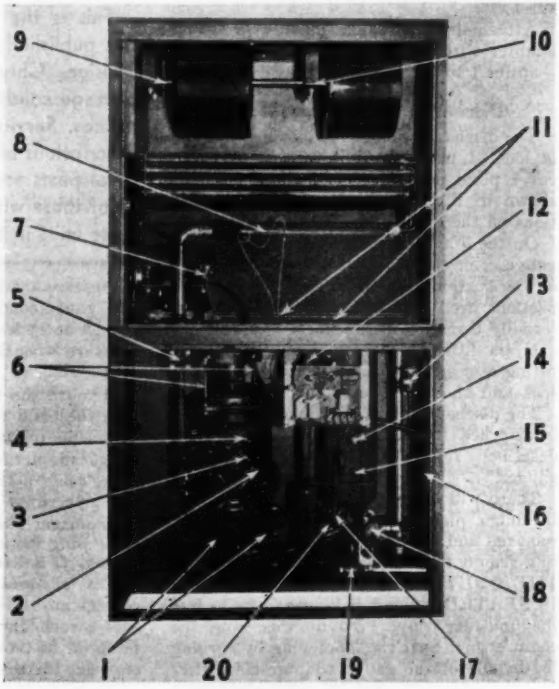


Fig. 3. Descriptive photograph showing location of the parts referred to in the text.

1. Shipping bolts
2. Discharge gauge connection
3. Suction gauge connection
4. Oil pressure gauge connection
5. Suction line flange
6. Shipping bolts
7. Fan motor oil cup
8. Thermostat bulb
9-10. Blower bearings
11. Drain pan bolts
12. Discharge shut-off valve
13. Expansion valve
14. Relief valve
15. "Snifter" valve
16. Electrical junction box
17. Charging connection
18-19. Water inlet and outlet
20. Liquid shut-off valve

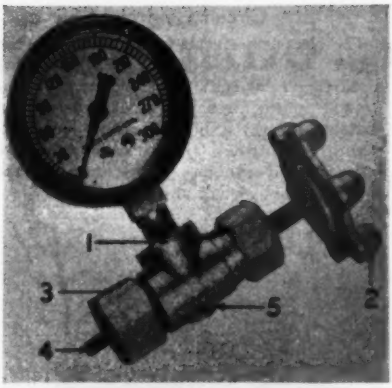


Fig. 6. The charging valve and gauge assembly.

Return Air

If it is desired to interchange the location of the return air grille from front to back of the unit, remove the blank panel from the back of the unit and install it in front where the return grille would normally be. There are coil baffles to change in this operation on the previous 5-SC unit.

The remote thermostat bulb should be moved from front to back. See that it is mounted so that no condensate water drips on the bulb, causing premature shut-down.

Final Inspection

After two or three days' operation, call back on the installation, and make sure all phases of the operation are normal. Show the user or his maintenance man how to lubricate the fan motor and blower bearings and care for the fan belt. If a water tower is used, indicate the best method for regular cleaning.

Point out the function of the air filter, and in some applications, such as barber shops, emphasize how important it is to keep this filter clean. Above all, do not operate without the filter. This clogs the coil, reduces efficiency, and frequently causes objectionable odors.

Continued customer satisfaction with any mechanical product is dependent somewhat upon regular maintenance service. It is recommended that a seasonal service agreement be arranged with the customer. Such service will provide for seasonal start-up and shut-down, filter replacement and other adjustments in the nature of maintenance service.

OPERATION OF THE THREE AND FIVE HP. UNITS

Compressor

The Chrysler Airtemp radial compressor is direct connected to a heavy-duty motor and hermetically sealed. Pistons are tinned cast iron, having one oil ring, and work in a replaceable cylinder liner. The connecting rods ride independently on a floating bearing. Suction and discharge valves are the ring type, spring steel and non-flexing. A heavy safety spring allows the entire discharge valve assembly to rise, thus passing a slug of oil or liquid refrigerant that otherwise could not pass through the regular discharge orifice.

Pressure lubrication through the entire compressor assembly is produced by an oil pump of the internal gear, automatic reversing type. This pump is located in the oil reservoir of the crankcase and is driven directly from the crankshaft. Oil supplied by the pump not only lubricates the mechanism, but actuates the automatic unloader device. An external by-pass consisting of a tube arrangement connects the discharge annulus of the compressor with the suction side. The by-pass opening is controlled by the unloader mechanism, which mechanism is governed by oil pressure. When the compressor is idle, no oil pressure is available against the unloader piston, and the piston moves from its seat, exposing the by-pass opening. This permits the gas from the high side to enter the compressor low side until these pressures are equal.

No Load Starting

The compressor motor, when energized through the control panel circuit, starts against an equalized or balanced pressure and without load, and does not become loaded until sufficient oil pressure has accumulated against the unloader piston to force it to its seat, thus closing the by-pass opening. Oil pressure is maintained and stabilized by an oil relief valve. The oil relief valve spring is factory set for the proper tension to relieve excess oil above a pre-determined point back through a by-pass opening into the oil reservoir of the crankcase. Oil in the crankcase reservoir is cooled by an oil cooler coil which receives its water supply from the condenser.

An oil separator is installed between the compressor discharge and the condenser. As

oil passes with the discharge gas from the compressor, the oil, being heavier than the gas, impinges on a series of screens located within the separator housing. This oil then drops into the separator reservoir and is discharged back into the compressor crankcase by the action of the automatic float mechanism installed in the bottom of the separator oil reservoir.

Expansion Valve

The function of the expansion valve is to regulate the flow of liquid refrigerant to the evaporator according to changes in superheat of the refrigerant suction gas leaving the evaporator. A vapor is superheated whenever its temperature is higher than the temperature corresponding to its pressure at saturation. Superheat is therefore the main operating force in the thermal expansion valve.

To take a superheat reading, strap a thermometer to the suction line near the compressor, attach a gauge adapter and gauge to the compressor suction connection. Note the suction gauge pressure and refer to a Freon chart for the temperature of the refrigerant at that pressure. Subtract this from the actual thermometer reading and the difference will be superheat. To increase the superheat and decrease the flow of liquid to the evaporator, turn the adjustment on the expansion valve "in." To increase the flow and lower the superheat, turn the adjustment "out." When the valve is set for a certain superheat, the remote bulb and capillary will govern the valve operation accordingly.

Replacing Valve Cage

The power and cage assembly is the only item needed as a replacement part as it is never necessary to renew the valve body. To inspect, clean or replace parts, remove the two cap screws, lift off the power assembly and remove the cage assembly. Replace gaskets in their proper places when reassembling the valve. Be sure that the two lugs on the cage assembly fit into the grooves provided for them in the power assembly; also see that the gear wheel on the cage assembly meshes with the adjusting gear in the side of the power assembly. The retaining pin on the cage assembly must engage the slot in the body flange. DO NOT FORCE THE VALVE TOGETHER — MAKE THE CAGE FIT PROPERLY BEFORE TIGHTENING THE BODY FLANGE. The valve is manufactured by the Alco Valve Company.

Circuit Controls

The electrical circuit is centralized in the control panel and consists mainly of (a) a starting relay, (b) transformer, (c) compressor motor overload breakers, (d) fan switch, and (e) a high pressure and temperature control. The function of these controls and switches in relation to the control panel circuit are:

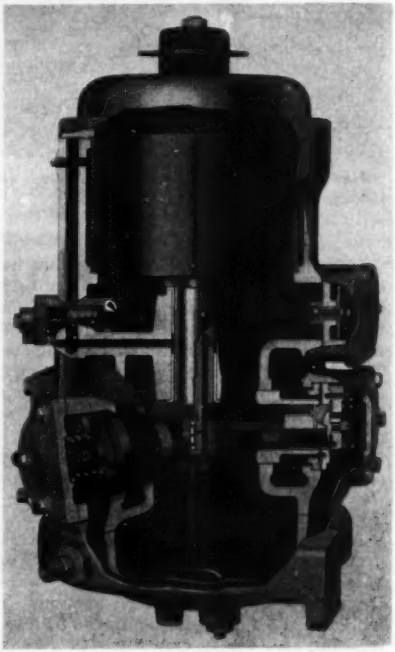


Fig. 7. Cut-away view of the 3-HC motor-compressor unit.

The starting relay is a magnetic switch that is energized from the primary side of the transformer.

The transformer changes the line voltage to approximately 20 volts so that the switching contacts and controls operate on low voltage. Low voltage reduces the arcing of points to a minimum; is a more practical means of circuit control in an electrical system as designed for the packaged unit; and reduces cost of remote control wiring.

The overload breakers consist of heater coils actuated by bi-metals; the action of

(Continued on page 50)

Relation of Humidity to Practical Refrigeration

By George Holman

OTHER than temperature, no single factor external to the circuit of the refrigerant affects refrigeration system performance as much as the moisture of the air. In refrigeration practice, humidity is both a blessing and an evil. It is very helpful in a number of ways; it is harmful in many other ways. Judged from the operating engineer's standpoint, the damage done and the trouble caused by moisture in the air outweighs all its admittedly useful qualities.

Aside from the fact that he must have some moisture in the air he breathes, lest his lungs be permanently injured by dryness, the practical refrigerating engineer finds the moisture of the air useful as an indicator of conditions within some parts of the system, parts among others into which he cannot see. Frost forming on exaporator pipes, for example, indicates to the engineer that heat of the air is being absorbed by the evoporator, and that the fluid within the evaporator used to absorb it is at a temperature below 32° F.

Melting of frost from the evaporator pipes indicates to the engineer that, although heat is still being absorbed from the air, the refrigerating fluid inside the evaporator is at a temperature above 32° F. In such a case the operating engineer logically assumes that the refrigerating fluid has become warm or has ceased to flow, or both.

Causes of Melting Frost

From the simple fact that frost is melting from evaporator pipes, the experienced operating engineer mentally moves backward from the effect in order to determine the cause. If the whole of the evaporator were "dripping" he would know from familiarity with the system that one or more of the following causes had brought it about:

1—One or more stop valves in the liquid line had been closed.

2—The expansion valve had been closed.

3—A return valve had been closed.

4—By-pass or pumpout valves at the compressor manifold had been opened.

5—The compressor had stopped.

6—A strainer in the liquid line had become stopped up.

7—A strainer in the suction line or at the compressor manifold had become stopped up.

8—The system had lost its charge.

Other Frost Signs

Moreover, the experienced operator is able to determine from the quantity and texture of the frost just how well brine cooling coils or direct expansion evaporators are performing. Heavy, sparkling frost on the last pipe of an evaporator or brine coil shows that the whole set of pipes is absorbing heat at capacity. In a direct expansion evaporator operating on a cooler kept at 30° F, the vapor returning to the compressor inside a pipe, covered with heavy sparkling frost is very likely to be wet, saturated, or containing very little superheat.

If the frost is "dry and dusty" and easy to scrape off the pipe, the experienced engineer recognizes some relevant facts from its airy or fragile nature. Among these are:

1—The temperature of the liquid boiling in the evaporator is low.

2—The pressure of the vapor returning to the compressor is low.

3—The air change has not been excessive.

4—There has not been an exceptionally heavy load in the cooler.

5—If room is above 32° F., the off cycle of the compressor is short.

6—There has been no machine valve leakage at the compressor during the off cycle.

On the other hand, a hard, glassy frost betrays many facts such as these:

1—Room temperature has been high and above 32° F.

2—Brine flow too sluggish, or brine too warm.

3—A heavy load caused meltage of the surface of the frost.

4—Rapid air change.

5—Long off cycle of the compressor, or expansion valve clogged.

6—Leakage of the compressor valves during the off cycle.

A return pipe only lightly frosted, while the remaining pipes have a heavier frost, tells the operator that the brine in an indirect refrigeration system is not circulating fast enough. If this condition exists at the last pipe of a direct expansion evaporator, the operating engineer knows that the expansion valve is properly throttled, and that the vapor returning to the compressor is superheated, that is, at a temperature higher than that indicated on the suction pressure gage.

Does Not Indicate Frost Line

In some refrigeration systems the moisture of the air, accumulating as frost on pipes containing fluids below 32° F., is deliberately used as a natural gauge to help the operator. Accumulators, or heat exchangers, contain both vapor and liquid of the refrigerant. But the quantity of each is unknown. Ordinary gauge glasses are not suitable to indicate the quantity of liquid, or level, because moisture or frost collects outside the glass and makes the meniscus difficult or impossible to see. Where the refrigerant is continuously below 32° F. a piece of pipe is substituted for the glass. The frost forming on the lower part of the pipe indicates the level of the liquid refrigerant boiling in the evaporator.

The "frost line" on this inlicator, as it is called, does not accurately indicate the liquid level. The lower the suction pressure, or the smaller the pipe, the higher the frost line will be relative to the actual liquid level. This is caused in part by conduction of heat downward through the metal of the pipe, but mainly to an upwardcurrent of cold vapor through the indicator set up by evaporation as the liquid acquires heat from the atmosphere. Most of this heat is the sensible heat of the air. Some of it, however, is derived from the latent heat of sublimation—that is, the latent heat of liquifaction and of evaporation combined—of the moisture of the air. The water vapor in the air is left clinging as solid particles to the pipe. Hence the frost line at or somewhat above the level of the liquid in the indicator.

Moisture of the air has other advantages. It prevents perishable foods from drying out, prevents the loss of flavor accompanying the rapid dehydration of fresh cuts of meat, keeps oranges, lemons and other fruits from shriveling, assists in the ripening of bananas and assists in the proper preservation of many other commodities. In air conditioning, as welf as in some other industrial processes, refrigeration is considered incomplete without proper control of humidity.

Against these advantages of humidity must be set those qualities of moisture in the air detrimental to the proper and economical operation of a refrigeration system. To the operator, one glaring disadvantage of moisture in the air is that it freezes out to form thick, white incrustrations about evaporator pipes. As before mentioned, this property of moisture of the air has some use. But it reflects radiant heat and thereby prevents rapid movement of heat from goods in storage direct to evaporators or brine pipes. It also insulates the pipe against absorption of heat from convection currents of air necessary to transfer heat from goods to pipes. If not frequently removed, this coating of frost will become thick enough to seal the spaces, between the pipes. Circulation of air and its transfer of heat from goods to evaporators or brine pipes is seriously curtailed.

In a direct expansion system efficiency and economy depend upon holding as high a suction pressure as is consistent with cooling room temperatures. The temperature of the boiling refrigerant must be below the temperature of the room, or heat transfer will not take place. Since suction pressure depends, among other things, upon the rate of evaporation, and since the rate of evaporation depends upon the readiness with which the heat of the goods can be transferred through the pipes to the liquid refrigerant, it is evident that heavy deposits of frost on the pipes lower system efficiency and reduce plant capacity. The removal of this frost is a problem directly created by moisture in the air.

Quantity of Frost

The quantity of frost and the rapidity with which it forms on the pipes depends upon the following conditions:

1—Temperature of the cooler.

2—Circulation within the cooler.

3—Number of air changes per day.

4—Temperature of the outside air, or air entering the cooler.

5—Quantity of moisture in the air entering the cooler.

6—Wet or dry surface condition of goods placed in the cooler.

7—Quantity of vapor exhaled by workmen.

8—Ratio of heat reaching pipes by radiation compared to that reaching the pipes by convection.

In most coolers the air is wet when air change is great, when warm, moist goods are first stored in them, when humidity of the outside air entering the cooler is high, either relatively when the temperature is low, or absolutely when the temperature is high, and when large quantities of water vapor are produced by breathing or perspiring of workmen. Wet air is perceptibly foggy throughout the cooler. If the air is "saturated with moisture," or near the saturation point, this condition is noticeable by streamers of foggy air drifting downward from the pipes of natural circulation evaporators, or whirling from a forced circulation evaporator. If no fog is visible in this manner, and the evaporators are known to be operating or the brine in circulation, the air of the cooler may be assumed to be dry. The relative humidity can then be ascertained only by humidostat or sling psychrometer.

Moisture on Foods

When a cooler door is opened, either for entry or for air change, there is an immediate outflow of cold, heavy air through the lower part of the doorway, and a countercurrent inflow of warmer and lighter air through the upper part of the doorway. If possible, heavy inflow of warm or humid air should be avoided, as it has a pernicious effect upon most perishable goods. Open cuts of chilled meats become "slick," and "dew" precipitates on cold surfaces. From this "dew" arises many of the foul odors sometimes encountered in cold rooms, which can be controlled only by judicious use of ozonizers, ultra-violet rays, or other deodorizing methods or substances. With proper control of humidity, such odors do not readily arise, or do not reach the aggravated stage.

The quantity of moisture in outdoor air depends upon the temperature and degree of saturation. Air "saturated with moisture" at 90° F. will bring into a storage room twice as much moisture as air "saturated with moisture" at 70° F. The former contains 218 grains of water vapor per 7,000 grains (pound) of dry air. The second contains but 110 grains per pound of dry air. Since dry air, though "saturated with moisture," can contain only 24 grains per pound at 30° F., it is evident that each pound of air at 70° F. entering a cooler must lose 110 minus 24, or 86 grains, while air at 90° F. saturated with moisture must lose 218 minus 24, or 194 grains. Even though the air is far from saturated, the quantity of moisture entering a cooler during normal four or five air changes is noticeable.

Moisture Settles on Walls

Some of the moisture contained in the air settles on the cold walls, floors, meats and other goods in storage. Much of it, however, finds its way to brine pipes or direct expansion evaporators, where it precipitates as frost. This settling of moisture as frost on the pipes is beneficial, inasmuch as it keeps such moisture from settling on and damaging perishables in storage. However, such accumulations of frost must be regularly removed.

Defrosting of cooling coils, whether they contain brine or a primary refrigerant such as ammonia, may be carried out by manual scraping, by melting off with water, or by forced melting with salt, calcium chloride or other solution. Brine coils may also be defrosted by circulating warm brine, or warm water, through them. In direct expansion evaporators the best method of defrosting the pipes is to "pump down," reverse the flow of vapor, and pump hot vapor back into the evaporators while using some other section of the system as an evaporator.

In rooms kept above 32° F., the coils may be cut off and the frost allowed to melt. This method has the advantage of being simple and economical. Only the labor of closing a valve is necessary; and the melting frost absorbs as much heat from the room as it gave up to the refrigerant when forming. It has the disadvantages of being slow, inefficient and apt to permit a too high temperature rise to damage goods in storage.

Frost Causes Valve Trouble

Frost forming on valves and valve parts is another in the long list of troubles caused by moisture of the air. A valve with the wheel covered with frost is difficult to set or operate. In many cases failure to get a valve closed immediately in a direct expansion system may result in danger to workmen, loss of refrigerant or damage to goods.

In one form or another, all corrosion about the external parts of a refrigeration system may be directly traced to moisture. In some places, such as brine tanks, brine coolers and flash tanks, the moisture is derived from other sources than directly from the air. However, corrosion of the steel stems of valves and the rusting away of brine coils or direct expansion evaporators in cold storages

is directly attributable to moisture of the air.

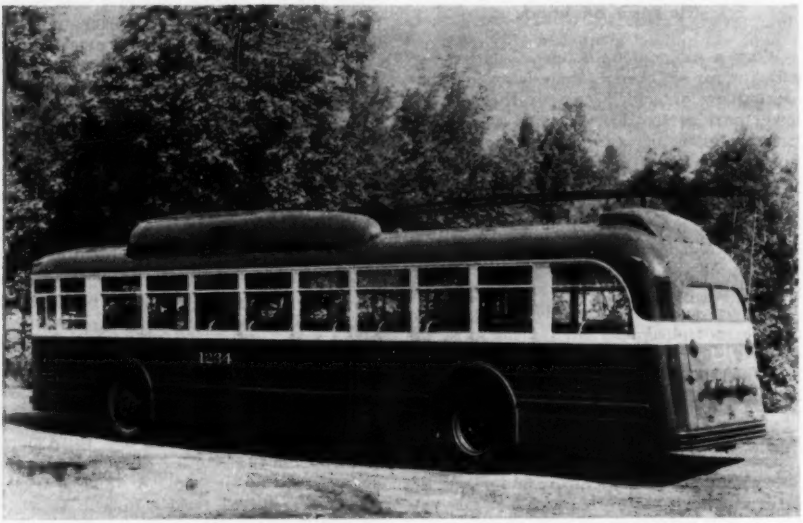
Whenever any part of a refrigeration system is opened, the troublesome effect of moisture in the air is carried into it. The dry air component of the mixture may be easily purged. But the water component has an affinity for some refrigerants, notably ammonia and sulphur dioxide, which may cause no end of trouble in the circuit. Many substances which ammonia or sulphur dioxide in their pure state will not attack, are readily attacked by them in the presence of moisture. A system charged with anhydrous ammonia when new no longer contains anhydrous (without water) ammonia after it has been opened a few times for repair or inspection.

In either physical or chemical combination with the refrigerant water formed by condensation of moisture of the air loosens litharge at the threaded pipe joints, beads and icicles at welded joints and scale or oxides throughout the system. These are swept along the circuit by the circulating refrigerant. Such particles may cause excessive wear of cylinder liners, piston rings and bearings of the compressor. They also become embedded in lead valve disks, and erode both needles and seats of thermo expansion valves.

Such water entering the system with the air sometimes causes the compressor lubricating oil to emulsify. Together with small particles of solids, the sludge so formed may damage bearings and cylinder walls, or stop up the needle orifices of thermo expansion valves. In some cases the water has been known to freeze in the expansion valve orifice, and keep an evaporator out of service.

In modern refrigeration practice one of the most useful features of humidity is that

(Continued on page 34)



First Air Conditioned Trolley

The world's first air conditioned trackless trolley has made transportation history since it was put into operation recently in Atlanta. Shown here is a side-view of the car, into which was built specially designed Carrier air conditioning equipment. A far cry from the old streetcar, this trolley has a cooling unit installed on the roof, while refrigeration equipment is under the floor. Heating equipment for maintaining comfortable conditions in the winter is also included in the Carrier installation. A survey by the Georgia Power Company, operators of the air conditioned trolley, covering the first 10,000 riders showed that 94 percent of them said that air conditioning increased the comfort greatly; five percent said it increased comfort a little bit; and less than one percent found no increased comfort. Another fact of interest is that 53 percent of riders who have automobiles said that if all trolleys were air conditioned they would ride more often. The vehicle was built at the Worcester, Mass. plant of the Pullman Standard Manufacturing Company.

Motor Pulleys Need Improving

Mr. Patten offers in the following some highly constructive criticism for the benefit of manufacturers and some instructive remarks for the benefit of the Service Engineer. The proper fastening of motor pulleys would seem to be a small matter, but as the author proves, these small things can become big worries when you encounter too many of them—Editor.

By W. E. Patten

SO many instances of motor pulleys coming loose have been encountered, on some makes of condensing units nearly 100%, that we have given the situation considerable study and have found some effective answers.

Below are listed the causes of pulleys coming loose where the manufacturer is to blame.

1. Only one set screw used in pulley.
2. Set screws always short. Set screw only 3/8" long where could be 1/2", 5/8" or 3/4" long.
3. Set screws used with SAE thread in cast iron pulley.
4. Pulleys bored too large. Some are bored 0.005" over shaft size on 3/4" and 1" shaft size.
5. Use of shaft key furnished by motor manufacturer frequently too short.

Suggested Remedy

1. Used of only one set screw allows pulley to rock on shaft with each revolution, particularly where set screw is in hub and not in vee groove. Even if pulley does not come loose it will mutilate shaft and may mate to shaft to make removal almost impossible.

All single groove pulleys should have two set screws on shaft key or two set screws 90° apart in hub. All multiple groove pulleys should have two set screws, one on shaft key and one 90° from shaft key. This positively prevents pulley motion in respect to shaft. Set screw 90° from keyway will bear on shaft but slight burr on shaft is not objectionable if service man is equipped with puller when next pulley removal is required.

2. Most all pulley manufacturers use shortest set screws available. Slight cost saving is involved. Instances are commonly encountered where manufacturer used 5/16" x3/8" set screw where he could have used 5/16"x3/4". Longer set screws having more threads engaged, stay tight better and lessen chance of stripping threads in pulley.

3. Some makers who once used steel pulleys at that time used set screws with SAE threads and continued the practice when they changed to cast iron pulleys. Result is that fine threads in cast iron pulley are easily stripped. SAE threads should never be used in cast iron. This goes also for threads of all bolts used on compressors to retain cylinder heads, flange valves, etc.

4. Motor pulleys should fit shaft with a nice push fit of about 0.002" clearance on 3/4" diameter shaft. One manufacturer consistently furnishes his pulleys at least 0.004" over shaft size and with a single set screw 5/16x3/8". We have record of 200 of these pulleys working loose with attendant shaft and pulley damage.

5. Compressor manufacturer usually uses shaft key furnished by motor manufacturer. These keys in view of economy are frequently too short so that pulley set screw only half way centers over end of key. The answer here is to cut new key as long as full length of key way in shaft and relieve one end of key by filing so that key extends fully to end of shallow end of keyway where milling cutter stopped.

Result of Experience

These conclusions were arrived at after experiencing hundreds of service calls during the war, when pulleys and even key stock were hard to obtain, where motor pulleys had worked loose with damage to pulley, shaft, and many condensers and fans.

After acquiring at least one spare pulley for most all models of compressors in operation (a card record is kept on all machines), we drilled all one groove pulleys and tapped them to have either two set screws on key or two set screws in hub 90° apart.

All multiple groove pulleys were drilled and tapped to have two set screws on key

and one at 90° with key. All short set screws 5/16x⅜ replaced with ½, ⅝, or ¾" length, whichever radial depth of hole would permit.

By installing these pulleys with additional set screws, original pulleys were returned to shop for drilling and tapping to eventually effect 100% replacement. Pulleys from new machines were removed and drilled for additional set screws before machine was allowed to go into operation.

Before the job was complete, over 50 pulleys had to be salvaged by boring out and installing bushing to restore original bore. About an equal number of motor shaft ends had to be built up by arc welding and remachined. Several hundred feet of keystock were used to make longer and better keys.

The net result has been no loose pulley trouble in the past year where before it occurred almost daily.

Yet all this trouble, time, and cost could have been eliminated by the machine manufacturers if they had resorted to the same procedure.

Suggestions pertaining to service man

(a) Don't try to remove pulley from motor by prying—frequently with such tools as a hatchet and a wrench handle. You may pull out the motor bearing, bend shaft, or damage pulley.

Maintain and use a gear puller.

(b) Never drive pulley on a shaft. You may be the sucker who has to take it off later.

If it will not push on shaft with a nice snug fit with key in shaft, look for the following.

1. Burr on very end of shaft. Feel out and remove with smooth flat file with rotary motion to avoid filing flat spot. Never file entire shaft.
2. End of pulley bore peaned over where some "jerk" used a piece of steel as a drift to drive pulley off. Remove offending spot with scraper or, better yet, a reamer.
3. Shaft key not fitted properly or squeezed out of shape by set screw. Fit by filing lengthwise only.
4. Pulley will go on shaft without key in place but not with key in position. If pulley is new one you may be in a tough spot. Keyway in pulley may be improperly cut diagonally with shaft so that it matches shaft keyway at one end and straddles it at other.

   If patience holds out you may file off part of key at opposite end and opposite sides to one-half depth to approach a fit.

(c) Never use anything but shakeproof lock washers to attach fan to pulley.

If pulley has no shoulder to center fan but depends on fan screws alone, split lock washers will not prevent fan from starting to move around screw hole clearance. Shakeproof lock washers lock fan to screw heads in all directions.

(d) When fan blades have been bent badly, broken or cracked, do not attempt to repair. Fan will most likely be out of balance and may cause pulley to come loose or damage motor bearings. Where one blade is broken off a four blade fan, opposite blade may be sawed off at similar distance from center to restore balance for temporary operation.

RELATION OF HUMIDITY

(Continued from page 32)

most of the air is not saturated with water, except in foggy weather or at other rare intervals. Such sensible heat of the air above a certain point, depending upon the degree of saturation, can be induced to unite with water and become latent. This results in a temperature decrease while the total quantity of heat in the air remains the same.

It is also possible for the total heat of the air to increase while the temperature of the air remains constant. This condition is attained or approached in the modern spray pond or cooling tower, in which heat of water vapor is added to the air. Water which has been warmed by passage through a refrigerant condenser is pumped to the pond or top of the tower. If it drops as a spray through air already saturated with moisture, say at a temperature of 90° F., the water will fall or rise to that temperature, if it drops far enough.

But if the air is unsaturated, with moisture, part of the water will attempt to saturate it by evaporation. To evaporate, it requires heat; and the only available sources of heat are air and the water itself. That part of the water which evaporates draws much of its latent heat of evaporation, amounting to about 1000 Btu per pound, from the remainder of the water. The vapor so formed is dissipated into the air, taking with it the heat acquired in condensing the refrigerant. Where the supply of condensing water is limited or costly, this use of partial humidification has been found to be an economical means of disposing of the heat pumped out of refrigerated spaces.

Refrigerants—

Physical and Refrigerating Properties

By GUY R. KING*

The data in this article has been collected to give a complete comparison of common refrigerants. Sufficient data is given that an intelligent selection of the proper refrigerant could be made for the average job. It should give an operator handling a given refrigerant the most important points regarding its operating characteristics. With the advent of new refrigerants; with low pressure manufacturers adopting higher pressure Freons; and most important, with practical men being expected to take care of all classes of refrigeration equipment owned by an organization, it is of utmost importance to every refrigeration man to know something of the different refrigerants used.—G. R. K.

THE evaporation of water, ether and ammonia have been used to produce cooling, or refrigeration. Each of these and many other fluids may be used for the same purpose. But some give better results than others. What is required of a good refrigerant? Why are some refrigerants used for certain applications, and other refrigerants used elsewhere? No one refrigerant has all the desirable qualities. So one must be chosen having the best balance between desirable qualities and undesirable qualities for the required application.

Requirements

Following is a list of qualities desired in a good refrigerant:

1—It should produce maximum refrigeration per cubic foot of vapor pumped.

2—It should have a reasonable condensing pressure.

3—It should have a reasonable evaporating pressure.

4—It should be stable.

5—It should have no effect on metal.

6—It should have no effect on oil.

7—Its critical temperature should be well above the condensing temperature.

8—It should be non-poisonous and non-irritating.

9—It should be non-inflammable.

10—It should be available at reasonable prices.

11—It should be easy to find leaks.

12—A minimum of power should be required to compress it.

13—Its freezing point should be well below the evaporator temperature.

Analysis

1—*It should produce maximum refrigeration per cubic foot of vapor pumped.* A refrigerant is wanted which will give the maximum amount of refrigeration for a given size or investment in equipment. Evaporators and condensers will change in size but little for different refrigerants, because their effect is produced mainly by the area involved. But a compressor of given size can pump only a given volume of refrigerant vapor. When the proper amount of refrigerant is evaporated to do the required amount of cooling, the vapor has a certain volume. This will vary considerably with different refrigerants. It is actually made up of two factors, the latent heat of the refrigerant (the amount of heat necessary to evaporate one pound of it) and its volume per pound.

2—*It should have a reasonable condensing pressure.* The condensing pressure depends on the saturation pressure of the refrigerant at ordinary condensing temperatures. This should not be too high. Excessive pressures require heavy (which means expensive) equipment and piping. Fig. 1 gives the temperature-pressure relationships of the common refrigerants, while Fig. 2 gives the same for some of the less common ones. These are given to a logarithmic scale so both high and low values can be shown. Pressures as well as other values can be taken from refrigerant tables.

3—*It should have a reasonable evaporating*

*Instructor, San Francisco Chapter, NAPRE

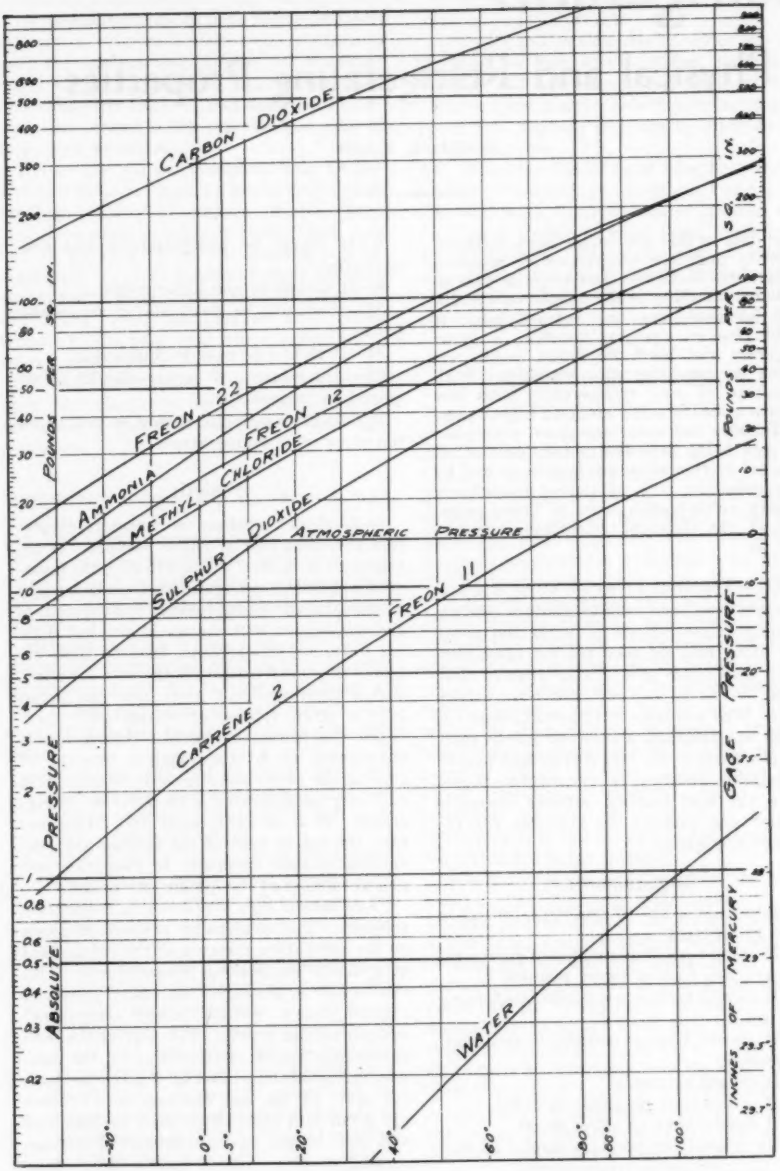


Fig. 1—Pressure-Temperature Relationships—Common Refrigerants

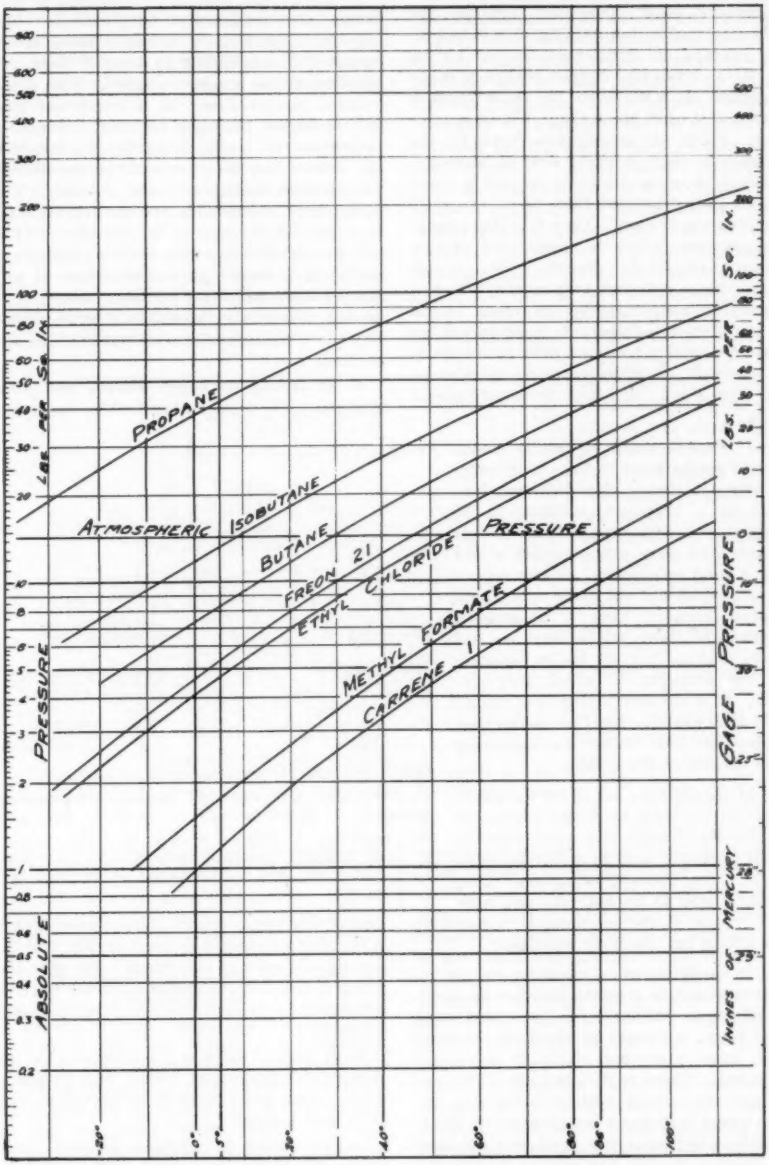


Fig. 2—Pressure-Temperature Relationships—Other Refrigerants

pressure. It is desirable to have an evaporator pressure very near atmospheric, but slightly above it. The rotating shaft of the compressor must come out through the crankcase wall with a packing or seal to prevent leakage of refrigerant out, or air in, Fig. 3. But this seal cannot always be made leakproof. If it has about the same pressure on each side of it, the leakage will be a minimum. Since air or moisture entering the system will cause a great deal of difficulty, it would be more desirable to lose a small amount of refrigerant than to allow air to leak into the system. Therefore the crankcase pressure, which is usually the suction pressure, should be slightly above atmospheric. Since different jobs require different evaporator temperatures, this leads to the use of different refrigerants to approach the ideal of a suction pressure near atmospheric but above it. Suction pressure can also be read from Figs. 1 and 2, or from refrigerant tables.

4—*It must be stable.* Stability means the refrigerant must remain in its original chemical form. For instance, ammonia is a chemical combination of nitrogen and hydrogen. If it should separate into these gases, neither would make a good refrigerant. Many vapors or gases which are not made of a single chemical element have a breakdown temperature above which they are not stable. That is, they are apt to separate into the elements of which they are made. It is necessary that this breakdown temperature for the refrigerant selected be well above the operating temperatures of the system.

5—*It should have no effect on metal.* A refrigerant must be chosen which will not corrode or otherwise react with the metals normally used in a refrigeration system. An absorption system using sulphuric acid as an absorber was once tried. Some of the problems introduced by such a fluid can easily be imagined.

6—*It should have no effect on oil.* A refrigerant must be chosen which has no harmful effect on properly selected lubricating oils. There is danger of chemical reactions which cause gumming, sludging or varnish formation. There is also trouble with some refrigerants mixing with and thinning the oil to where it makes a poor lubricant. Ethyl chloride, which once was used as a refrigerant, thinned the oil like mixing it with solvent. It gave so much trouble some manufacturers tried glycerine instead of oil as a lubricant.

7—*Its critical temperatures should be well above its condensing temperature.* All vapors or gases have a temperature above which it is impossible to liquefy them, regardless of the pressure applied. This is the critical temperature. It is important that this be higher than any required condensing temperature. Notice the difference between the critical temperature and the breakdown temperature mentioned under stability. The vapor may be heated above the critical temperature by the heat of compression. If it can be cooled below this before condensing, no harm is done. It will condense at any temperature below its critical. But if it is heated above the breakdown temperature any place in the system, irreparable damage is done.

8—*It should be non-poisonous and non-irritating.* It must be handled by operators and service men. Also if poisonous or highly irritating, a hazard is created in case of leakage or breakage of equipment. Imagine the panic if ammonia or sulphur dioxide were to break out in an auditorium or other crowded location.

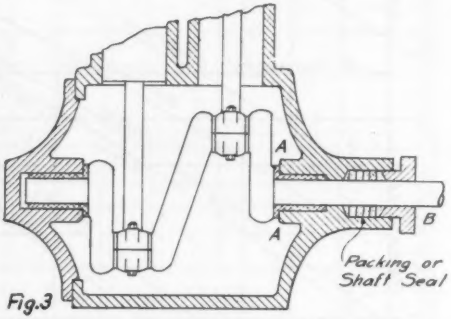


Fig. 3

If crankcase pressure A equals atmospheric pressure B, there will be no leakage through the packing. If pressure A is greater than B, any leakage present will be from A to B.

9—*It should be non-flammable.* An inflammable refrigerant would also create a hazard both when handled by operators, and in case of leakage.

10—*It should be available at reasonable prices.* Sufficient quantities of the refrigerant should be available in ordinary markets

at a reasonable cost. At this cost it must be of sufficient purity to cause no refrigeration difficulties.

11—*It should be easy to find leaks.* Some simple means of determining whether leaks are present in the system, and of finding exactly where those leaks are located should be possible.

12—*A minimum of power should be required to compress it.* The different refrigerants may require different amounts of power to compress them. Obviously, the less the power required the cheaper are the operating costs of the refrigerating plant.

13—*Its freezing point should be well below the evaporator temperature.* If flow is to be maintained in the system, a refrigerant which freezes at temperatures encountered in the evaporator cannot be used. Except where water is used as a refrigerant, this did not have to be considered a few years ago, and still does not on ordinary jobs. But on those special jobs which go down to 100° or more below 0°, this must be considered.

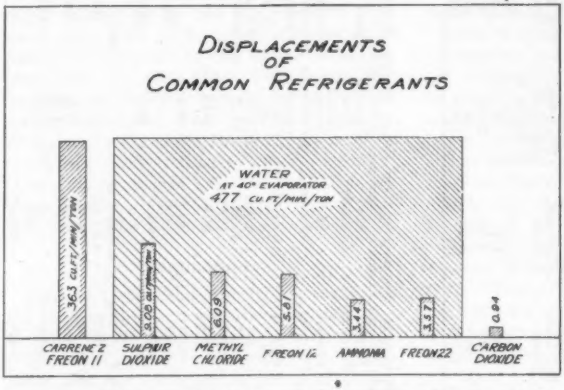


Fig. 4.—Graphic representation of the volume of vapor to be pumped to produce one ton of refrigeration at standard ton conditions

Physical Properties of Common Refrigerants

Table I lists some important physical properties of the most common refrigerants. Table II gives the same data for some of the less common refrigerants. Table I (and II) gives first, the name by which the refrigerant is most commonly known, then its chemical name, then its chemical formula. Some refrigerants are commonly known by their chemical name, and some by a trade name. All are occasionally referred to by their formula.

Item 4 gives the boiling point at atmospheric pressure. This alone gives some indication of the pressure characteristics. A low boiling temperature would mean such a temperature can be obtained in the evaporator without a vacuum. But a pressure would be necessary to condense the refrigerant. A very low boiling temperature, such as 50° to 100° below 0° would indicate considerable pressure was necessary in the evaporator for ordinary refrigerating temperatures. An excessively high condensing pressure would probably be required. On the other hand, a boiling point of 50° to 100° above 0° would indicate a vacuum was needed in the evaporator, and the condensing pressure would be near atmospheric. Boiling temperatures like that of water (212° F.) indicate an exceedingly high vacuum in the evaporator, and some vacuum in the condenser.

Items 5 and 6 give the condensing pressure and evaporator pressure for standard ton conditions, that is, 86° condenser and 5° evaporator.

Item 7 gives the latent heat per pound of refrigerant at 5°. This is the amount of heat necessary to evaporate one pound of the refrigerant. *Item 8* gives the volume, or actual cubic feet of space which would be filled by the vapor from one pound of refrigerant evaporated at the pressure shown in item 6. *Item 9* combines items 7 and 8 (with a correction for flash gas) to show the actual amount of vapor that must be pumped per minute to produce one ton of refrigeration, or 200 Btu's per minute. These figures give a direct comparison of the sizes of compressors necessary to produce the same amount of refrigeration. Fig. 4 graphically shows this information for the different refrigerants.

Item 10 gives the critical temperature, and *Item 11* gives the freezing point. The condensing temperature must always be below the critical temperature and the evaporator temperature must always be above the freezing point.

TABLE I.—PHYSICAL PROPERTIES OF COMMON REFRIGERANTS

1. Common Name	Water	Carrene 2 Freon 11	Sulphur Dioxide	Methyl Chloride	Freon 12	Ammonia	Freon 22	Carbon Dioxide
2. Chemical Name	Water	Trichloro-monofluoro-methane	Sulphur Dioxide	Methyl Chloride	Dichloro-difluoro-methane	Ammonia	Monochloro-difluoro-methane	Carbon Dioxide
3. Chemical Symbol	H_2O	CCl_3F	SO_2	CH_3Cl	CCl_2F_2	NH_3	$CHClF_2$	CO_2
4. Boiling Temp. at Atmospheric	212°	74.7°	14°	−10.6	−21.7°	−28°	−41.4°	−109.3°
5. Cond. Press at 86° lbs/sq. in. gage	28.67"[1]	3.6 lbs.	51.7 lbs.	80.8 lbs.	93.2 lbs.	154.5 lbs.	169.1 lbs.	1024 lbs.
6. Evap. Press. at 5° lbs/sq. in. gage	29.67"[1,2]	23.9"[1]	5.9"[1]	6.1 lbs.	11.8 lbs.	19.6 lbs.	28.4 lbs.	319.7 lbs.
7. Latent Heat at 5° Btu's/lb	1071[2]	84	169.4	180.8	69.5	565	93.4	115.3
8. Volume at 5° cu. ft/lb	2444[2]	12.3	6.42	4.66	1.48	8.15	1.24	.267
9. Displacement 5°, 86° cu. ft/min/ton	477[2]	36.3	9.08	6.09	5.81	3.44	3.57	.943
10. Critical Temp	706.1°	388.4°	314.8°	289.6°	232.7°	271.2°	204.8°	87.8°
11. Freezing Point	32°	−168°	−103.9°	−143.7°	−252.4°	−107.9°	−256°	−69.9°
12. Least Detect. Odor	None	20%	3 to 5 ppm	....	20%	53 ppm	20%	None
13. Irritability	None	None	8 to 12 ppm	None	None	700 ppm	None	None
14. Toxicity	None	10% 2 hr.	.7% 5 min.	2% 2 hrs.	30% 2 hrs.	.5% 30 min.		30% 1 hr.
15. Flammability	None	None	None	8.1-17.2% 69 lbs/sq. in.	None	13.1 to 26.8% 54 lbs/sq. in.	None	None
16. Toxic in Flame	None	Yes	None[3]	Yes	Yes	None	Yes	None
17. Sp. Gr. Liquid 5° Water = 1	1.00[2]	1.57	1.47	.99	1.44	.66	1.34	.985
18. Sp. Gr. Vapor Atm. Air = 1	....	4.85	2.56	2.04	5.2	.74	4.0	2.35
19. Power 5°, 86°	....	.98	1.00	.99	1.03	.99	.98	1.78
20. Compression Temp. 5° and 86°	282°[2]	113°	195°	156°	102°	210°	131°	160°

[1] Inches of vacuum instead of lbs. per sq. in.
[2] For 40° evaporator instead of 5°.
[3] No more so than its original toxicity.

TABLE II.—PHYSICAL PROPERTIES OF SOME OTHER REFRIGERANTS

1. Common Name	Carrene 1	Methyl Formate	Ethyl Chloride	Thermon Zeon Freon 21	Freon 114	Butane	Isobutane	Propane
2. Chemical Name	Methylene Chloride	Methyl Formate	Ethyl Chloride	Dichloro-monofluoro-methane	Dichloro-tetrafluoro-methane	Butane	Isobutane	Propane
3. Chemical Symbol	CH_2Cl_2	$C_2H_4O_2$	C_2H_5Cl	$CHCl_2F$	$C_2Cl_2F_4$	C_4H_{10}	C_4H_{10}	C_3H_8
4. Boiling Temp. at Atmospheric	103.6°	89.2°	54.5°	48°	38.4°	33°	13.6°	−48°
5. Cond. Press. at 86° lbs/sq. in. gage	9.4"[1]	1.8"[1]	12.4 lbs.	16.5 lbs.	15.3 lbs.	21.5 lbs.	44.8 lbs.	143 lbs.
6. Evap. Press. at 5° Gage Pressure	27.5"	26.4"	20.8"	19.2"	16.6"	13.3"	3.3"	30.5 lbs.
7. Latent Heat at 5° Btu's/lb	149	230.9	177	....	....	169.5	159.4	169.1
8. Volume at 5° cu. ft./lb	52.9	47.2	17.1	9.13	....	9.98	6.41	2.51
9. Displacement 5°, 86° cu. ft./min./ton	74	49.9	24	20.4	....	16.2	11.5	4.1
10. Critical Temp	421°	418°	361°	....	295°	308°	272.7°	204.1°
11. Freezing Point	−143°	−148°	−217.7°	....	....	−211	−229	−309.8°
12. Least Detect. Odor	20%	...	...	20%	20%	...	...	....
13. Irritability	....	...	...	....	....	...	....	....
14. Toxicity	5% 30 Min.	2-2.5% 1 hr.	6-10% 1 hr.	....	30% 2 hrs.	...	....	....
15. Flammability	Slightly	4.5-20% 96 lbs./sq. in.	4.3-14% 98 lbs./sq. in.	....	No	1.7 to 5.7% 102 lbs./sq. in.	....	2.4 to 8.4% 104 lbs./sq. in.
16. Toxic in Flame	Yes	No	Yes	Yes	Yes	No	No	No
17. Sp. Gr. Liquid 5° Water = 1	1.34	.97	...	1.46	....	...	.6	....
18. Sp. Gr. Vapor Atm. Air = 1	2.95	2.08	2.24	3.75	5.93	2.3	2.3	1.9
19. Power 5°, 86°	.96	....	.95	....	....	...	1.07	1.35
20. Comp. Temp. 5°, 86°	205.1°	149°	106.3°	....	....	...	80.1°	92.9°

[1] Inches of vacuum instead of lbs. per sq. in.

Item 12 gives the least amount of the refrigerant mixed with air that is detectable by odor. This may be given in per cent or in parts per million (ppm). Note it takes 10,000 ppm to make 1%. *Item 13* gives the per cent usually found to be irritating. *Item 14* gives the per cent and time of exposure necessary for a fatal dose. The actual hazard of a refrigerant is usually a combination of these. A refrigerant which is easily detected by smell, and particularly one which is irritating, may not be as hazardous as a less toxic one which gives no particular warning of its presence.

If a vapor can reach 10% concentration before it creates dangerous properties, it can be considered as relatively non-toxic. At this or greater concentrations, enough air is displaced that normal breathing does not supply sufficient oxygen. Therefore any gas, toxic or not, would cause discomfort. Water is not a poison, but if one were shut up in a room filled with it, he would not live long. Similarly, this could be true of any substance other than air. One other thing to consider with respect to hazards is the weight of the refrigerant vapor. This is shown in item 18. If the vapor is heavier than air, any leakage could very easily collect in large concentrations in low places such as basements or holds of ships. Once in such a hollow, positive ventilation is necessary to eliminate it.

Flammability

Item 15 gives some information regarding the flammability and explosion hazards. Interstate Commerce regulations recognize it only as inflammable or non-inflammable. But there is some variation in the hazards involved. Inflammable vapors will burn with more or less limited mixtures of air. This mixture must not be too rich or too lean. Naturally, the narrower the limits of the mixture that will burn, the less chance of having exactly that mixture. After being ignited, some vapors burn much more rapidly than others. Also, the burning increases the temperature which increases the pressure. High speed burning plus the pressure increase is what causes explosive violence. Item 15 gives the limiting proportions of inflammable mixtures, and the maximum pressures built up by ignition.

Item 16 gives information regarding another hazard. Some refrigerants which are non-poisonous and non-inflammable break down to poisonous compounds when exposed to high temperatures. Thus, such a refrigerant leaking into a room with any high temperature source could be hazardous. Unvented gas stoves or electric heating elements could cause such a breakdown. But the toxic products are very irritating so will tend to drive occupants out of a room before dangerous amounts can be breathed. This breakdown would also be a definite hazard to fire department personnel in case of fire in the building.

Item 17 gives the specific gravity of the liquid at 5° compared to water, that is, the ratio of its weight to the weight of the same volume of water There is some variation in the weight of the liquid with temperature, but for most refrigerants this will not run over 10% for a change from 0° to 100°. *Item 18* gives the specific gravity of the vapor at atmospheric pressure compared to the weight of air. This is the condition of the vapor when it escapes from a system. The weight of the vapor varies almost directly with the absolute pressure.

Item 19 gives the horsepower required to produce one ton of refrigeration at standard ton conditions. This is the power required to actually compress the vapor without including any of the losses involved. Actual power including losses will run up to 50% higher than these figures. But for the same size jobs, the power losses will run approximately the same for the different refrigerants.

Item 20 gives the compression temperature reached by the vapor at standard ton conditions. That is the temperature of the compressor discharge. High temperatures require water jacketed cylinders, and give rise to lubrication troubles due to oil breakdown.

(To Be Continued)

INGENUITY SAVED THE DAY

THIS is what happened to Mr. Benny Lane's Kelvinator Unit. Some workman taking down the chimney tossed a brick through the window screen and condenser, bursting it beyond repair. I could not get a new condenser, so had to get Mr. Lane some refrigeration quick, and he is still operating it as I fixed it.

Using a 50 ft. coil of tubing as a condenser, I connected it to the compressor and receiver, and by-passed the old condenser. I put the coil of tubing in a pan of water on the floor and let the garden hose run into it.

He says it takes less current. This unit is on a reach-in box and display case. *Submitted by William F. Wolf, Denton, Md.*

Determining the Rate of Service Charge

THE amount to be charged to your customer for your service on their refrigerating system should be determined from the actual costs plus a fair profit as shown by an analysis of your books. It takes several months of operation under a bookkeeping system, however, before a good analysis can be made and in the meantime service charges must be established and used in order to carry on business.

One method of determining service charges consists of utilizing a few known facts and evolving them into a mathematical problem. The resulfs are theoretical costs but are useful in getting a start. The analysis to follow in addition to arriving at these costs will set forth the reasoning behind a sliding set of charges in preference to a flat hourly rate.

Transportation costs vary with the different makes of cars used and the section of the country you are operating in. But in order to use round figures which can be substituted we will assume the original cost of the car to be $1,000. Such a car should run a total of 60,000 miles or 15,000 miles per year if used for service only in the average territory.

Since the car will last four years on this basis, and we will assume you will get an allowance of $200 on it when trading for a new one, the average depreciation per year will be $800 ÷ 4 or	$200
Insurance	50
Licenses	20
Operating costs—about 2c per mile or 15000 × .02 which equals per year	300
Total transportation cost per year	$570

On the basis of an 8 hour day, there are a little over 2400 working hours per year. The transportation cost per hour, then, equals

$\frac{\$570}{2400}$ or a little under 24 cents per hour.

In an analysis of more than 1000 typical service calls, it was found that the service call averaged two hours time on the premises, or the 1000 calls consumed 2000 total man hours on the premises. Further analysis showed that 30% of these calls required 15 minutes or less on the premises, 20%—15 to 30 minutes, 25%—30 minutes to one hour and 25%—one hour or over. To state it in accumulated figures we find that 50% required one-half hour or less, 75% one hour or less and the balance required one hour or more. It was also found that 30% of the man's time was "lost time" from a revenue standpoint, spent in travelling, telephoning, etc., and that 18% "nuisance calls" could be expected. These "nuisance calls" include call-backs, promotional calls, unnecessary calls by the customer in which nothing could be found wrong with the equipment. No charges could be made on any "nuisance calls."

If we say a man's time is worth $1.00 per hour, and since 30% of his time is "lost time," the $1.00 per hour you pay him represents only 70% of what it costs you for an hour's work on the premises. Therefore, you are actually paying him $\frac{100}{70} \times \$1.00 = \$1.42$ per hour for his productive time.

Likewise, since 18% of his calls will be "nuisance calls" for which you will collect nothing, $1.42 represents only 82% of your cost of an hour's productive work on the premises. The total will be $\frac{100}{82} \times \$1.42 =$ $1.73 for one man's time.

Overhead must eventually be determined from an actual cost accounting of your operations, but if we assume overhead amounts to 20% of your total costs per hour, then $1.73 represents 80% of those costs and the final labor cost will be $\frac{100}{80} \times \$1.73 =$ $2.16 per productive hour. Adding to this the 24 cents per hour for transportation we arrive at a total of $2.40, cost of sending a man out to do an average one hour's work on the customer's premises.

In order to work with round figures, we will say your costs are $2.50 per hour, and because the average call requires 2 hours on the premises, it means you will have to get $5.00 average per call.

Since the average call requires 2 hours on the premises and 30% of the man's time is lost time, the total time per call is 2.8 hours, and the average travelling time per call is .8 hours or 48 minutes. The cost of the man's

(Continued on page 51)

Commercial Selling

How to increase business by doing a more effective job of selling

Plenty of Opportunities Ahead if You Have Been

Selling Service with Service

By Grier Lowry

ONE of the most optimistic prognosticators of good things ahead for refrigeration service engineers is solidly-built Charles Stein, who was a service trail blazer in Kansas City, Kansas, who has skippered his business through lean depression years and the prosperous war years, and staunchly opines that on the local horizon the future promises to be packed with opportunities galore for the proficient refrigeration technician.

The silver-lined opinions of the Kansan, who has operated his own completely-equipped shop in this city for over fifteen years, are based primarily on surveys he has conducted in his sphere of repair operations.

Grocers plan expansion of refrigeration units which for too many months have been pitifully inadequate for their needs. Expansion among food merchants will be mandatory because of the supplementary refrigeration storage space that will be required to care for frozen foods which have already started to be shipped to the grocery for sale a day or two after being harvested.

Dairies in this area, many of which have had machines serviced by the capable hands of Mr. Stein, are also drafting concrete additions to their refrigeration units, and because he has given these customers adept and prompt servicing during the war, he anticipates being on the receiving end of repair-work on the enlarged refrigeration units the dairies have scheduled. Leaks, mechanical breakdowns, etc., of dairy machines have brought Charles Stein scurrying out of bed quite frequently, but a realization of the food value of milk in wartime, with an eye on futuristic business, caused him never to hesitate to make these emergency calls. All dairies now own refrigeration equipment, the firms who sell raw milk as well as the ones who pasteurize. Air conditioning is fraught with possibilities for local service engineers, and it has been joyfully noted by Mr. Stein that more and more of the new homes under construction are designed with air conditioning unit inclusions. Since he is experienced in servicing air conditioning equipment as well as refrigeration, this trend should constitute increased repair business. Potential buyers exist in this hustling city by the dozens for the one-room cooler units. There has been practically no domestic air conditioning servicing in the past, with Stein securing most of his repair jobs from serum plants, meat packing plants, factories and large retail organizations.

Returning veterans who have developed a fondness for the outdoor life, will be in the market for home freezers to care for the rabbits, squirrels, and other small and large game which they will stalk during the winter months and have within skillet reach during the summer months.

"It all adds up," said Charles Stein, "to an avalanche of new opportunities for the service engineer. The newest refrigeration or air conditioning equipment off the assembly line will need to be installed and minor repairs will probably be required."

Charles Stein, operator of a refrigeration service institution in Kansas City, Kansas. He was one of the pioneers of refrigeration service in this area.

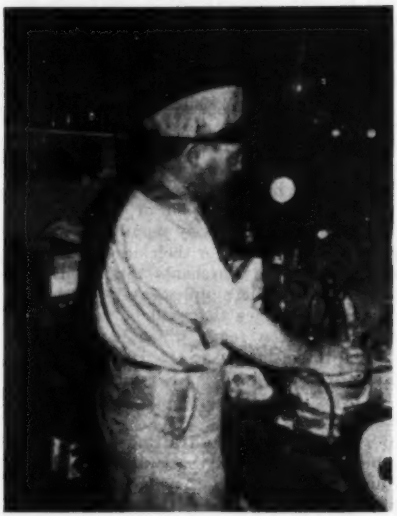
The ground work for securing his share of this futuristic business has been very carefully laid by the repair technician. He has astutely augmented his equipment during the war, and now has a compactly-equipped repair division in his attractive, but small, building which measures 22 by 38 feet, situated in one of the thickly-populated communities of this city.

His parts department is one of the most complete in this territory, is maintained in an efficient and neat fashion. Stein likes to buy parts in quantity in order to get cash discounts.

Stein parted with his veteran assistants to the army, and after searching for months for capable replacements, decided there weren't any to be had, refused to lose his reputation for first-rate craftsmanship, so toiled from sunrise to almost bedtime by himself in an effort to offset the loss. Despite his valiant try, however, he found he couldn't care for all of the calls that came in, so he abandoned most of the household calls unless they were willing to wait, withdrew his advertisement in the telephone directory because it was creating an overwhelming amount of business, and generally retrenched until the employment situation eased. Now the two assistants are scheduled for an early release from the army, and will be back at Stein's plying their trade, a fact that has Mr. Stein heaving a sigh of relief because their return will take a terrific strain from his shoulders.

Equipment is conveniently placed in the shop, and there is a machine bench, an electrical bench, and a bench used, in the main, for just chasing out minor motor ills. There is another bench which is set up with a vise on each side. An office, with a desk, telephone, and easy chair, all of which has been allowed to gather dust because the owner was in constant attendance on the repair detail that descended on him, is at the front of the building.

A cooperative enterprise is a vision of Charles Stein, and although he has made only small progress with this project, he discusses it with enthusiasm. Such an undertaking would have a plumber, furnace repairman, radio service engineer, and Mr. Stein, working together under the same roof, sharing expenses, not profits, but giving one another "leads" on repairwork. It is characteristic of Charles Stein to plan such an enterprise. His activities in the refrigeration repair field have constantly been typified by a cooperative attitude, with patrons, associates, and competitors.



Charles Stein, service engineer has one of the most compactly, completely, equipped shops in this area. His two assistants went off to the war, and rather than sacrifice the quality of his work, has carried on alone during the war.

"Extra Touches" in DOMESTIC REFRIGERATION SERVICE

By Robert A. Latimer

ONE of the more important considerations of the refrigeration service engineer taking the "long view" toward future domestic work should be "extra touches" which build goodwill and return business, according to Henry Wall, head of Valley Appliance Company, Fresno, California.

Mr. Wall, who went into appliance reconditioning and service work during the war, feels that there is a definite job ahead for every service firm in overcoming ill-will and resistance stemming from poor business methods and high prices during the conflict. "It is unfortunately true that the public in general has been dissatisfied with domestic refrigeration service," he pointed out, "inasmuch as many appliance dealers new to the business made mistakes, charged too much for their work, and failed to turn out the type of service calculated to make friends. Making calls myself I have talked to dozens of housewives who have nothing but bitter complaints in regard to the repair of their refrigerators, and many more who are not backward in stating that they are looking for someone else to provide this type of service when things return to normal. Obviously such a condition came about because appliance dealers going into service work to maintain their buildings and staffs charged too much for the work, attempting to make up for lost sales volume. In a like manner, they used inexperienced mechanics who usually did poor work at too high an hourly rate. It is up to us to rectify the situation."

Service to Aid Sales

Valley Appliance Company, which combines new appliance sales with a full variety of service work, opened up in October, 1944, when Mr. Wall established a good location for securing new appliance franchises in a suburban section of Fresno. Along with a handsome store, he built a large appliance service shop at the rear, complete with lathes, welding equipment, power saw, drill, etc., and scouted up service mechanics from among retired utility employes and former repair shops.

"We saw in service an opportunity to make a lot of friends who will later make up our postwar customer list," Mr. Wall said. "Therefore we set up the service system on that basis—charging a fair time and materials rate for all work inside and outside the store, accepting no work we felt we could not handle expertly, and thus making sure we left no dissatisfied customers behind. In one year we've learned a good deal about customer relations, particularly as applied to refrigeration repair service—and we set up our plans entirely on that experience."

Now Enlarging

Currently enlarging the service shop for complete overhaul on ranges, refrigerators, washing machines and other domestic equipment, Mr. Wall plans to operate with six or seven mechanics, concentrating on serving the immediate area surrounding the store. The new shop is laid out on "mass production" lines, with complete power equipment for each phase of work, convenient truck docks and a large parts room.

"Extra touches" in service work will be stressed all the way in Mr. Wall's future plans. "We've isolated everything we feel goes to make a disappointed customer," he smiled, "and offset each one in advance. It's these little touches which make the difference between a satisfied customer and one inclined to disparage the service to her friends."

First, each Wall serviceman is furnished a canvas tool basket, another canvas for covering the floor around the appliance, and cleaning materials for removing any grease or other stains he may cause in the kitchen. Working on the canvas pallet the mechanic will not stain linoleum or woodwork, and keeping his tools in the basket will prevent nicks and scratches which irritate fastidious housewives. If he does stain anything in the kitchen, his instructions are to clean it up thoroughly before affixing a label which gives the name and address of the firm. These facilities eliminate one of the worst drawbacks.

(Continued on page 60)

SELL OR GO BUST

By HARRY BOYD BROWN*

WE have all been hearing too much lately about the vast demand existing in this country for all kinds of merchandise, and about the many billions of dollars in liquid savings, currency and bonds in the hands of an impatient public anxious to spend it.

We read statistics galore about the millions of radios, electric refrigerators, washing machines, houses, automobiles, pieces of furniture, electric vacuum cleaners and so on almost without end that the public would buy this minute if the merchandise were available.

Certainly there is a tremendous pent-up demand for almost any goods that you can think of, and billions of dollars are available to pay for it. Every survey proves that a buying boom will sweep over America within the next year. It almost makes one believe that industry, wholesale and retail, will go on a self-serve basis.

However, the smart manufacturer, wholesaler and retailer will not assume, will not take it for granted that this buying will be on any such self-serve basis, with people standing in line to take the merchandise away from the retailer regardless of price or quality.

The American public is more cautious, calculating and canny than many people seem to think. They will still consider price and quality, and they will still want to be sold.

Yes, all of these millions of items, even in the face of this pent-up demand, must still be sold and sold intelligently, and it seems to me that too many manufacturers, wholesalers and retailers, dazzled by the vast market demand that apparently awaits us, are overlooking the vitally important matter of long haul, wide, carefully planned distribution, marketing and selling.

Undoubtedly a tremendous, pent-up demand for peacetime goods lies just ahead of us, but we seem to forget that the greatest pent-up demand that ever faced American manufacturing industry faced it in 1941—250 billion dollars' worth of supplies, goods and material for almost immediate delivery to the Armed Forces of the United States.

And then we saw with what lightning speed, flexibility and efficiency American industry caught up with that terrific demand and delivered the goods that so greatly helped make victory possible. Yes, the war has proven how fast the flexible, resourceful production men of America can move, and we won't have to wait long until American industry, with the same speed, flexibility and efficiency will reconvert and catch up with this pent-up demand for peacetime merchandise.

The important thing to remember is that this catching up will be only a portion of the job of giving employment to the necessary millions of people and contributing to a national yearly income of 120 billions of dollars.

Selling Will Create Employment

The full objective, the necessary goal, must be continuous employment for these people and a continuous national income of 120 billion dollars steadily creating an ever better standard of living for all of the people.

Yes, all of this merchandise must be sold and sold continuously in the same steady volume to the ultimate consumer, and if we are not fully prepared with our distribution and selling, we may shortly find it literally pouring out of our ears.

And that is why selling, well organized, efficient, constructive selling becomes so essential, so absolutely indispensable—not later but right now today.

People who ought to know say that before the war this country had nearly 7 million sales people but, because of the war, millions have gone into other activities. It is estimated, and I believe it, that we will need 10 million sales people to sell the peacetime goods—to sell continuously the vast production of American manufacturing industry. This means that 5 million new sales people will have to be employed and carefully and thoroughly trained.

And let us hope that the buying wave that will sweep this country for the next 12 or 14 months will give everyone who needs it, the time and opportunity to build up efficient, keen and enthusiastic sales organizations that will produce that volume of selling

* Merchandising Manager, Refrigeration Division, Philco Corp.

which permits continuous top production and national prosperity.

Today there are some new peacetime manufacturers who, because of the war, possess the manufacturing space, the machinery and the money and the ambition to cash in on the present pent-up demand situation, but who have absolutely no knowledge of and have done no planning on distribution, selling and advertising which three things can almost over-night become the answer to success or failure.

But do not think for one moment, that the manufacturers of long standing in this country are taking anything for granted because of this pent-up demand for goods. They are not neglecting for one moment the vital importance of distribution, selling and advertising.

You've heard a lot about the vast unsatisfied demand for radios, electric refrigerators, air conditioners and about the millions of television receivers that will be sold as soon as produced. And undoubtedly that is all true—very true.

But let me say that Philco's merchandising, advertising and selling programs are planned for today with even greater power, intensiveness and detail than ever before. Our 15 Division Managers with their 75 divisional salesmen, and our 150 wholesalers with all of their salesmen are working daily with the 25,000 Philco dealers to leave no stone unturned to get the business, and to keep sales rolling in steadily and continuously. That is the job that we must plan now on doing in America—steady and continuous selling.

Salesmen Are Underestimated

We are approaching the salesman's era in this country faster than we may think. It is going to be up to him to move on to the retail customer the vast production of American industry.

I hear and am beginning to believe that too often the salesman is a greatly underestimated, under-rated and under-paid individual. His vital importance in the commercial scheme of things is too often overlooked and ignored.

I doubt if anyone has a greater respect than myself for the unparalleled accomplishments of American engineering, research laboratory and production men in peacetime—and certainly in our war effort.

But we must not forget that it was the vast army of American salesmen in the many years past whose steady, nationwide volume of selling made possible these great manufacturing institutions with their fine organizations of engineers, research and laboratory experts and production men.

In our business I know that the Philco sales representative is not only a business man—but a well rounded business man. He is a salesman, a merchandiser, a retail and wholesale expert and an advertising man all rolled into one. His business is to get constant turnover for the dealers, and for the wholesalers, and the natural result is that he gets turnover for himself and the company he represents.

Now I presume that everybody here is in business—some of you are manufacturers—some wholesalers, and many of you undoubtedly are retailers. You've probably got your warehouses, your wholesale places of business and your retail stores.

You are lucky—particularly the retailers—because within the next 6 months, in my opinion, the scarcest commercial thing in America will be retail store buildings. Everybody seems to want to go into business, and only one building, one store goes on any piece of ground.

And now is the time—within the next 6 months—to make every possible improvement on that store of yours. The front of it, the back of it, the interior arrangement and decoration, the shelves, display islands, counters, everything. Get the store ready now in every detail for a real volume of business.

The Retailer

Now, finally, I wish to speak of the world's greatest salesman, the ultimate and most important link in the merchandising chain—the man who sells at retail.

By all means do not overlook your retail salesman. Select these salesmen carefully, enthuse them over their opportunities, and then start now to give them a thorough training. Call often and continuously on the manufacturer and the wholesaler to help you in this training work. They are ready, willing and able to do it, and besides, everybody should get acquainted.

Why do I call the good retail salesman the greatest salesman in the world? There's no trouble explaining that and proving it! He's the first salesman who really makes a sale. The fellows ahead of him in the procession have made what they call sales, and have probably had a tough time making them in some cases.

"WHEN A JOB CALLS FOR MORE THAN ONE EVAPORATOR ON A SINGLE UNIT I call for an MODEL 235 Suction

WHEN A JOB CALLS FOR MORE THAN ONE EVAPORATOR ON A SINGLE UNIT

I call for an A-P MODEL 235 Suction Pressure Valve . . . It's a good feeling to know what a Valve can do . . . *and I know!* . . ."

THAT is the comment from a Refrigeration Service Engineer when we asked him regarding his personal experience with "A-P" Valves.

Confidence like this is based on practical, day-in day-out experience in maintaining the nation's refrigerating machinery in spite of today's difficulties and handicaps. It is a trust shared by a widespread army of refrigeration service engineers who know that dependable "A-P" Controls, Valves, and Solenoids save them time-wasting call-backs — insure *customer satisfaction.*

A-P has cracked some hard nuts in the way of refrigeration servicing problems. Always feel free to consult us about yours!

AUTOMATIC PRODUCTS COMPANY

2484 NORTH THIRTY-SECOND STREET MILWAUKEE 10, WISCONSIN

Export Department — 13 East 40th Street, New York 16, New York

Illustrated Bulletins and full information sent upon your request.

DEPENDABLE *Refrigerant Valves*

STOCKED AND SOLD BY REFRIGERATION JOBBERS EVERYWHERE . . . USED AND RECOMMENDED BY REFRIGERATION SERVICE ENGINEERS

But when the manufacturer's salesman gets his order from a wholesaler, the wholesaler is buying something that he not only hopes—but expects—to make a substantial profit on when he gets it into the retailer's hands. And when the jobber's salesman completes that transaction, he's taking an order from a store executive who counts on turning over the merchandise he's buying at a figure that means an addition to his bank account.

But when it comes to the retail salesman's turn . . . he's selling and nothing else but! He's selling to the buyer with the least money, and he's selling against the stiffest competition. No matter what he has for sale, everybody in the world is his competitor. He's selling his article—whatever it is, even if it is a Philco—against the competition of the grocery man, the butcher, the landlord, the gas company, and the tax collector.

He's selling to the men or women who do not expect to get anything except pleasure or service or some creature comfort out of what they're buying, and are balancing the cost of a new car, a new hat, or a new radio against the bills coming in on the first of the month from a dozen unrelated and supposedly non-competitive sources. But they are competitors—the toughest sort of competitors—because they are the very necessities of life.

And it's meeting and beating this competition that makes the good retail salesman head man in his field. No merchandise is really sold until he sells it. The whole manufacturing, distributing, merchandising structure is built on his selling efforts. The dealer, the wholesaler, the manufacturer—even the factory employees—depend on what he does and says when a customer walks into the store.

That's why Philco cultivates the good will, respect and friendship of the retail salesmen. Philco factory salesmen and the wholesaler's salesmen hold get-together meetings with all the retail salesmen throughout the United States the year 'round—and frequently.

All the new products and new models are displayed and explained in detail. All national and local advertising campaigns and promotions are revealed and discussed. Motion picture films teach the technique of inside selling and outside selling.

In addition, there are Sales Manuals that include complete sales dialogues which might naturally occur with every type of customer. What the salesman says—what the customer says—right down to getting the first payment and the name on the dotted line.

EXTRA TOUCHES IN SERVICE

(Continued from page 45)

Second, when scheduling a repair call, the dispatcher makes an appointment, and gets the mechanic there when specified. Going a little farther he asks the housewife which door she wants the mechanic to enter, and where to park his truck—eliminating tracking up of front rooms, and obstructing driveways—both of which happen frequently under normal circumstances. "Women appreciate such things," Mr. Wall pointed out. "Thus we stress them at every call."

When entering the home, the mechanic gets out a work order form which is also the bill for the job, and explains it to the housewife, pointing out the labor and parts charges involved so that she understands them thoroughly. Few can complain once the method of charging for service is understood.

Mechanics all wear white uniforms, a clean one daily, made possible by a laundry arrangement which guards against the necessity of showing up in a neat, spotless kitchen wearing grimy overalls.

Another touch is prevention of the need for "going back for more tools." Valley Appliance Company trucks contain every tool necessary to work on any make refrigerator, plus a number of specialized tools designed and made in the shop for particular jobs. These "rolling shops" will eliminate a lot of lost motion in the future, and have already paid for themselves, according to Mr. Wall.

"We think we have met in advance anything likely to cause complaints or criticism," Mr. Wall summed up. "Actually, we intend to operate on a sort of golden-rule basis which experience tells us is the real road to success in this field."

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Servicing the Airtemp

(Continued from page 28)

the bi-metals being governed by the amperage of the circuit. In case of compressor motor overload, the bi-metal behind the heater coil opens a switch in the secondary circuit. These breakers are factory calibrated and set for a pre-determined trip rating and must be manually reset in case the overload acts.

The fan switch on early model packaged units was the snap action type and on later models, the mercury type. The fan circuit is always single phase and energy is supplied from the line terminals on the control panel. Operation of the fan circuit is therefore independent of the compressor circuit.

Fan motors on early model units had the overload switch mounted on the control panel and had to be manually reset in case of fan motor overload. Fan motors, on later units, are equipped with internal overload protection and automatic reset.

The High Pressure and Temperature Control is a control with a dual purpose which functions as a safety cut-out in the event of excessive pressure on the high side of the condensing unit and as a means of controlling the return air temperature from the conditioned area. The action of either control affects the compressor operation.

A single switching mechanism is incorporated within the control operated by individual bellows, capillary, and remote bulb. The capillary for the high pressure bellows is connected to the condensing unit discharge line and the remote bulb from the temperature bellows is mounted on a bracket in the return air stream below the evaporator coil.

From the wiring diagrams, Fig. 4 and 5, it may be seen that outside of the fan circuit, all controls and switches are connected in series. When the control contacts are closed, the holding coil of the starting relay is energized and starts the compressor by drawing the relay in and making the circuit to the main supply switch.

S S S

DETERMINING SERVICE CHARGE

(Continued from page 42)

travelling time has already been figured in the cost per hour on the premises, which makes the figure seem high.

To the average customer, $2.50 per hour straight rate is a high rate, and to the person who is going to give you several hours work on one job, it is not a fair rate in comparison to the person who is going to give you one hour's work or less. Remember that this analysis is set up on the basis of average revenue per call and that 30% of that revenue is for travelling time. In order that the charge should be fair in both cases and at the same time net you the average of $2.50 per hour, a sliding rate becomes necessary.

It was previously stated that 50% of the calls required one-half hour or less on the premises and if the average cost of $5.00 per call is to be distributed fairly then this "half hour on the premises group" should bear the greater part of the per hour revenue.

In other words, in order to cover our cost of $5.00 per call, we must make a minimum charge of 50% of $5.00 or $2.50 for the first ½ hour of work, 75% of $5.00 or $3.75 for the first hour's work, and $2.50 per hour thereafter.

S S S

REFRIGERATION AND AIRCRAFT TO MAKE NEW FRESH FOODS AVAILABLE

FOUR long strides forward in the world of food soon may combine to give the housewife or chef an unlimited choice of "fresh in-season" menus, no matter where the food is grown, where it is served, or when it is served.

These developments, by the Refrigeration Equipment Manufacturers Association, include:

1. Plans of major airlines to greatly expand shipments of fresh fruits, vegetables and other foods so that they will arrive on any market in a matter of hours after they are harvested in any part of America and many parts of the world.

2. Improved packaging of perishables while fresh including lighter packages for air-borne shipments, on-the-spot "pre-packaging" to reduce spoilage, and family-size packaging for refrigerated display and self-service in stores.

3. New type refrigerated display cases for perishables in stores, thus keeping "fresh foods fresh" several days longer than heretofore has been possible.

4. Far wider use of new facilities in homes, apartment buildings, stores and locker plants for preparing foods for freezing, properly freezing them and storing them after frozen —thus keeping the "freshness in" for indefinite periods.

In actual practice, these advances would enable the purchaser to buy foods grown almost anywhere while they are still fresh, and in any quantity, freeze them, and have them available "fresh-frozen" whenever they are needed or desired.

Thus, the housewife might buy, in quantity, the foods she now considers "rare"—California Grenshaw melons, papaya, cherimoya, guava or mango from South Florida or New England baby lobster, for example—and have them available for serving "fresh" months after they have gone out-of-season in the very localities in which they are grown.

Recent airline experiments, according to REMA, have shown that even fresh seafoods have great possibilities for air shipment, including the edible portions of oysters, scal-

lops, shrimp, lobster and crab. Pre-cooled skin fish are protected with a moisture-proof wrapping and can be shipped without refrigeration and with a temperature rise of only one-half of one degree while in transit.

Other perishables would be packaged on arrival in family sized units ready to be placed in newly-designed refrigerated cases. As a result, housewives would be assured, not only of a wide selection of fresh produce, but of fruits and vegetables neatly packaged, cleaned and chilled, ready for freezing and storage in home units or locker plants. Such packaging and handling cuts spoilage about 25 percent, recent tests disclosed.

Of added importance in this widened food picture is that there are distinct benefits in both eating qualities and nutritional value of vine and tree ripened foods. Research by Wayne University, Detroit, for instance, revealed that tomatoes ripened in the field compared with tomatoes from the same field harvested at the "mature green" stage and shipped through the usual channels showed a ratio of approximately 25 to 14 more vitamin C content in favor of the field-ripened product. Experiments with figs, apricots and peaches indicated marked benefits in flavor and sugar content when these crops are left on the trees an additional week or so—which would be possible through quick air-shipment to markets.

JOBBERS ASSOCIATION VOTES NAME CHANGE

At a meeting of the Board of Directors, held at the Stevens Hotel in Chicago, October 29th, 30th, and 31st, the name of the National Refrigeration Supply Jobbers Association was changed by vote of the members and approval of the Directors. In changing the name to Refrigeration Equipment Wholesalers Association, it is the opinion of the members that the new name more fully describes their group and its functions.

Among other important matters of business handled at the Directors' meeting was the approval of a new emblem from the Association, the design of which was created by the C. R. Markham Advertising Agency.

A broad program for expansion and development of the Association was planned with steps being taken to conduct an advertising campaign directed toward keeping the industry informed of the aims, activities, and accomplishments of REWA.

Foundation was laid for encouraging better organization of regional groups within the Association to bring about a close working relationship, not only in regard to local problems, but a closer tie-in between national and regional activities.

The next general meeting for members of REWA is planned for March, 1946.

NEW LOCKED ROTOR RATING FOR RESIDENTIAL SERVICE

RESOLUTION recommending to member-companies an increase in the permissible locked rotor currents to 40 amperes for residential service at 115 volts has been passed by the Edison Electric Institute and also by the Pennsylania Electric Association.

This important action resulted from the discussions of a joint committee of the Edison Electric Institute and the Air Conditioning and Refrigerating Machinery Association, covering particularly the installation of room air conditioners in residences. This type of connected load is expected to increase substantially over the next few years.

The Air Conditioning and Refrigerating Machinery Association is recommending to its member-companies that those air conditioners which are for use in residences and which do not meet the 40-ampere limit at lighting voltage be manufactured and installed for 230-volt operation.

G-E SUGGESTS LAYOUT FOR APPLIANCE STORES

IDENTIFY your store as an electrical appliance store if you want to build sales and be able to meet competition in good times or bad.

That is the advice now being given to appliance retailers by General Electric Company in a new book entitled "Your G-E Appliance Store."

Citing the results of a survey made specially for the Company by Walter Dorwin Teague, famous designer and industrial consultant, the book points out that "retail stores, in their very effort to attract atten-

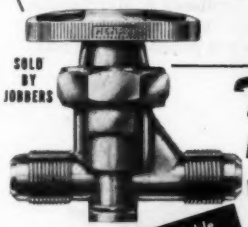
Only Henry makes a Diaphragm Packless Valve that is

NON-DIRECTIONAL

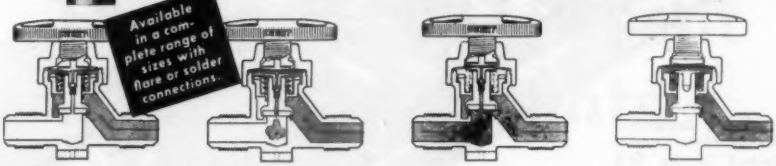
By means of a patented balancing channel in the lower valve stem, explained in detail below, the Henry Diaphragm Packless Valve cannot stick shut regardless of the pressure differential above or below the valve seat. When using a conventional valve, there is always the possibility that a valve installed in reversed position could fail to open if sufficiently high pressures should develop above the seat. The Henry Diaphragm Packless Valve, however, can be relied upon to give positive performance under all conditions of service because it is truly non-directional.

You will also like the Henry feature of having inlet and outlet ports in line on two way and three way valves. This eliminates tube bending and results in neater lines and lower installation costs.

During the war Henry Diaphragm Packless Valves have been widely favored by all branches of the armed services. It is only natural that, as our country gradually turns to the problems of Peace, this Henry Product again will be the logical choice of manufacturers, jobbers, contractors and service organizations everywhere.



The Difference Between a Henry *Non-Directional Balanced-Action Diaphragm Packless Valve and a Conventional Packless Valve*



BALANCED-ACTION VALVE IN CLOSED POSITION—High pressure above the seat, low pressure below the seat. High pressure regions are shown in color. Pressure in spring cage below diaphragms is the same as that in main passage of valve body above the seat. This is due to seepage between the lower stem and the guide. Downward pressure of the bearing plate on the diaphragms seals the upper port of the balancing channel.

OPENING THE BALANCED-ACTION VALVE—As hand wheel is turned to open valve the diaphragms, because of pressure beneath them and their own snap action, rise and expose the upper port of the balancing channel. The high pressure, shown in color, unseats ball check and is instantly released through the open channel to the low pressure region below the valve seat, thus achieving "balanced-action" by equalizing pressures.

BALANCED-ACTION VALVE IN FULL OPEN POSITION—Equalization or balancing of pressures above and below the seat, as shown in color, guarantees that this valve can never "stick shut" but will always open positively, regardless of original differential in pressures. When there is high pressure below the seat and low pressure above, the balanced valve opens easier than other types because of the light weight spring.

CONVENTIONAL TYPE WITHOUT BALANCED-ACTION—As hand wheel is turned to open valve the diaphragms rise. When the differential between high pressure, shown in color, above seat and low pressure below seat is greater than force exerted by heavy spring, stem "sticks shut"—valve remaining closed. The heavy spring required in this type of valve greatly increases diaphragm wear and strain and causes stiff closing.

HENRY VALVE COMPANY
3260 WEST GRAND AVENUE, CHICAGO 51, ILLINOIS

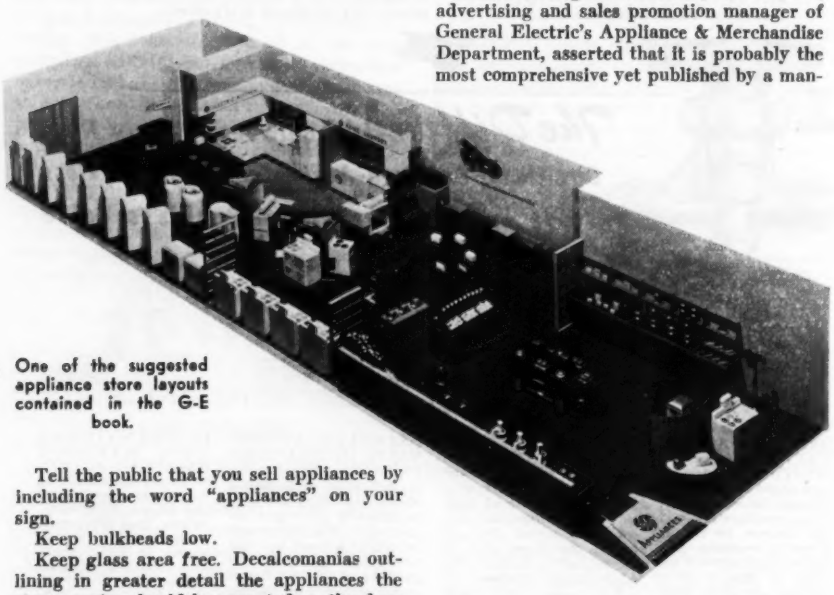
PACKLESS AND PACKED VALVES • STRAINERS • DRYERS FOR REFRIGERATION AND AIR CONDITIONING AMMONIA VALVES • FORGED STEEL VALVES AND FITTINGS FOR OIL, STEAM AND OTHER FLUIDS

tion, have defeated their own purpose. A disordered, frenzied clamor for attention, in which nothing can be heard for the shouting, should give way to a unified, clean, distinctive impression."

On the basis of this finding, the new G-E publication offers concrete suggestions for the unified design of the five basic types of appliance stores. Some of the specific points that are made concerning store fronts are these:

Strive for clean lines that are direct, attention getting, inviting.

Display the name of your store on a panel mounted flat against the store front over the windows and doors. Distant traffic can be attracted by a smaller projecting, double-faced sign.



One of the suggested appliance store layouts contained in the G-E book.

Tell the public that you sell appliances by including the word "appliances" on your sign.

Keep bulkheads low.

Keep glass area free. Decalcomanias outlining in greater detail the appliances the store carries should be mounted on the door or window just below eye level.

Pointing out how even the finest painting can be spoiled by a bad frame and improved by a good one, the G-E book asserts that "appliances, too, make far better impressions if they are presented in attractive surroundings—given the proper stage-dressing and harmoniously arranged."

In order to help retailers build "the frame that sells the picture," the book also presents detailed suggestions for laying out the five basic types of stores.

Carrying out its precept to avoid disorder and strive for a store that is noticeable, appealing, clean and unified, G.E. makes these further basic recommendations.

Arrange appliances within the store so that pedestrians can see as many as possible through the windows.

Allow plenty of room for the customer to move round on the sales floor. Avoid crowded aisles.

Provide an adequate service department plus a working demonstration kitchen and laundry.

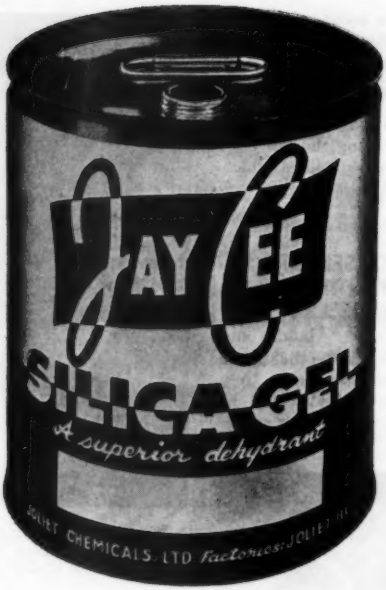
Group appliances so that shoppers for one item are exposed to many related items.

Make sure that the background for the appliances is as modern as the appliances themselves.

In announcing the new book, A. L. Scaife, advertising and sales promotion manager of General Electric's Appliance & Merchandise Department, asserted that it is probably the most comprehensive yet published by a manufacturer in an effort to help electrical appliance retailers to set up modern, sales-building stores or departments.

"Any retailer who would like to see a copy of this book is free to call upon his nearest G-E major appliance distributor," he said.

Included in the book, in addition to the section on store fronts and arrangements, are chapters telling where to locate a new appliance store; how much space to allow for the appliance display stock; what sort of demonstration rooms should be estab-



25 lb. pail illustrated.

The Ideal Dehydrant for Refrigerants

JAY CEE refrigeration gel is one of the most efficient dehydrating agents. It is especially prepared for dehydration of refrigerants, and may confidently be used for drying Freon, Methyl Chloride, Sulfur Dioxide or any other similar agent. Removes acids, prevents rust or corrosion and is not affected by oil. The special particle size retains its crystalline structure—assuring uniform distribution in the cartridge and complete contact with all pore surface areas.

We offer you this economical 25-lb. container with resealable Easy-Pour spout. Dehydrators can easily be filled from this Easy-Pour container, and resealed to protect unused contents until needed. Special gasketed cover makes Easy-Pour container air-tight when not in use.

There are excellent opportunities for jobbers and distributors to develop profitable business on Jay Cee Silica Gel in a few territories. Write for details.

JOLIET CHEMICALS, LTD., INDUSTRY AVENUE, JOLIET, ILLINOIS

JAY CEE

SILICA GEL

A superior dehydrant

lished; how to use light to boost sales; how to identify the retailer's trucks, and so on.

Another important section of the book is devoted to display merchandisers for all types of traffic appliances and radios. Using the blueprints that are available from General Electric, any woodworking shop or carpenter can build the 12 basic pieces which form almost any type of display.

✕ ✕ ✕

PRINCE OF IRAQ SELECTS AMERICAN HUNTING LODGE ON WHEELS

LITTLE did the writer of "Aladdin and his wonderful lamp" realize that some day a "Genie" would make available to a Prince of Bagdad, a house that could be moved to great distances, and on only a moment's notice.

The Honorable Ali Jawdat, official representative of His Highness, and his daughter inspecting the Marvel refrigerator in the Schult Luxury Liner "Hunting Lodge."

Instead of depending on a "Magic Lamp" his Royal Highness, Regent and Crown Prince Emir Abdul-Iilah of Iraq decided upon a more positive source, namely, "American Enterprise." During a recent trip to this country, His Highness selected a Schult Trailer Coach, which has already been delivered to the Honorable Ali Jawdat, official representative, along with a Willy's "Jeep." Both are now enroute to His Highness . . .

The Copeland Compressor for air conditioning is shown installed inside an attractive cabinet base. The blower is shown on ceiling.

the Schult Luxury Liner to be used as a hunting lodge . . . the Willys "Jeep" for towing motive force.

While this "Magic House" will not have doorknobs of gold nor window panes of fine jewels, it will be equipped in such a manner that even the imagination of "Arabian Nights Creators" could not conceive. No doubt but that Aladdin would have gladly traded his most palatial mansion with all of its seasonable discomforts for the year-round pleasure that will be enjoyed with comfortable all year temperatures made possible by the installation of Air Conditioning and Oil Heat.

Neither did "Genie" have anything to preserve and prepare the fine and delicate foods of His Highness that compares with the modern range and electric refrigerator.

With the exception of a few special appliances and devices (including a self contained water system and power plant) the Schult Luxury Liner is the same as those that are delivered to people all over the United States every day.

Official delivery and transfer of title was made in Washington at the Jefferson Memorial Monument grounds by A. Lee Painter, Jr., President of the American Trailer Company, Washington. All those in attendance at the ceremony wished "His Royal Highness" many pleasant hunting trips.

"FREON-12" and "FREON-22"

serve aircraft instrument test room maintained at -85°F.

In the Teterboro, N. J., Eclipse-Pioneer plant of the Bendix Aviation Corporation, aircraft instruments are subjected to severe low-temperature tests. A specially constructed "cold room" held at –85°F., approximates temperature conditions encountered at altitudes of 40,000 feet and more. To attain this low temperature, "Freon" refrigerants are used exclusively.

The "cold room," measuring 17 x 27 feet, is divided into four compartments. Temperature in a vestibule equipped with Dole plates is maintained at plus 20°F. In an anteroom with blower unit, the temperature is 0°F. Here, operators pre-heat their flying suits worn in the test rooms and acclimate themselves to the extreme low temperatures. Both chambers are designed to trap moisture. A 10-h.p. "Freon-12" General Electric Condensing Unit refrigerates the rooms.

There are two testing chambers, both of which operate at –85°F. Temperature control in the "Type-Test" room is provided by two G. E. condensing units using "Freon-22" in 30-h.p. low-stage and 20-h.p. high-stage units. For a production test room of somewhat larger dimensions, there are three G. E. condensing units; two 40-h.p. low-stage units in parallel and a 40-h.p. high-stage unit. The installation, housed in a compact machinery room, produces five tons of refrigeration at approximately –100°F. suction temperature. Both test rooms are insulated with a 12-inch wall of Fiberglas and have observation windows of tempered glass seven panes thick. Coil bunkers and blowers are located above the rooms.

> "**'Freon-22'** *easily enables us to get these low temperatures with maximum safety," states Harry J. Walpole, Jr., refrigeration engineer and co-designer of the installation. "It is particularly adaptable to the suction pressures at which we desire to operate. During pull-down tests, we reached a low of –94°F."*

Low-temperature requirements in any industry are readily met with "Freon" refrigerants. These safe and efficient refrigerants, now available in unlimited quantities, are widely approved and specified by prominent refrigerating engineers everywhere. Write for more complete information. Kinetic Chemicals, Inc., 10th and Market Sts., Wilmington 98, Del.

(Below)—One of the refrigerating installations consisting of two G. E. compressors and a condensing unit.

KINETIC

FREON

REG. U. S. PAT. OFF.

safe refrigerants

"Freon" is Kinetic's registered trade mark for its fluorine refrigerants and propellents

Plastic Tubing for Soda Fountains

Used originally as a substitute for block tin tubing, because tin was not available, plastic tubing is rapidly taking first place in the choice of material used in carbonated water systems. Having certain definite advantages over block tin, plastic tubing shows every indication of remaining—not as a substitute but in preference to tin.

By Kenneth J. Swaski MMR2/c, USNR

Here is a bit of information that I found through practical tests. I have charge of all refrigeration aboard ship (U.S.S. Kaweah) and I put plastic in our soda fountain. It is very satisfactory.

DUE to the high cost and shortage of material needed to maintain and effect repairs to lead or block tin tubing, a desirable substitute has been found which will serve to great advantage to refrigeration men.

The presence of electrolysis is well known where the coils of lead tubing are bound by metal strips and are submerged in water for cooling carbonated water. The co-efficient of Vinylidene Chloride is about .045 and is not a very good conductor of heat.

Vinylidene Chloride plastic was chosen for carbonation machines because it is a thermoplastic. It can be reheated and take on another form or different shape. It is chemically resistant, tough, odorless, tasteless, flexible, non-inflammable; and the thermal expansion, dimensional stability, and machinability makes it desirable to work with. It can be placed within a large tube beneath a concrete surface or the concrete can be troughed and the plastic tubing placed in and then covered without injuring the tubing.

Through experience I have found it to withstand a pressure of 500 pounds per sq. inch at nearly 100 degrees Fahrenheit and as low as 32 degrees Fahrenheit. Carbonated water generally remains at room temperature unless it is installed in a basement. Generally it is between 50 and 95 degrees F. It is ideal for hook-ups between the carbonator and cooling coils and tanks. There is no chemical decomposition of material or injurious reaction to the human body as may be encountered with copper tubing.

It is not advisable to use it as a cooling medium as the co-efficient of heat transfer is low. Therefore it should not be used, as is lead tubing, for cooling water by going through a cold water bath and then to the dispenser. But a very good plastic to hold the existing lead tubing and a preventative against deterioration of wood has been developed. It is the Styrene plastics. The Polystyrene plastics are clear, stiff, moisture resisting, form holding, tough and can be drilled and machined.

When the Vinyedine plastics are subjected to freezing temperatures, the carbonated water inside freezes and expands the tubing, making it crack. These cracks are knife like in appearance and the cracks are about one to four inches in length. Although this does not prevent any part that is not cracked from being used again since it retains its strength and quality.

Where much care must be taken in mending lead pipe or tubing, and rosin is used, a simple flare is used with plastic tubing. If used on carbonated water the union should be tinned but it is not absolutely needed, as brass does not have the same effect on the carbonated water chemically as does copper.

To flare plastic tubing, it is put in the flare block the recognized way, then warmed with a match until the edge to be flared has a glossy appearance, then the flaring bell is firmly squeezed down and left about 45 seconds, enough time to reset. It will not retain the 45 degree angle but will remain at approximately 30 degrees. Flare connectors are generally brass but plastics are available on the market.

There are several other useful adoptions for plastics around the soda fountain such as runs from the compressor as the liquid line or the suction line when a vacuum does not exist. It is very easy to run inside of pipe, between walls or floors and it does not seem to be attacked by rodents. It is quite hard to collapse and kink.

In conclusion, I find that due to the shortage of all types of metallic tubing, plastic tubing has aided in overcoming this difficulty. The post-war applications for plastics are numerous in the refrigeration field, for the service man.

SERVICE POINTERS

Practical Solutions of Your Service Problems

THIS department is an aid to service engineers who are seeking new devices or methods to improve their work. All the service pointers have been supplied by the subscribers. THE REFRIGERATION SERVICE ENGINEER invites readers to submit "down-to-earth" practical service and installation information. Five dollars will be paid for each pointer published. Every service engineer has one or more "kinks" that have proved useful in every day practice. Here is your opportunity to exchange service pointers with the other fellow and earn $5.00 for the information. Write up your idea today and mail it to the *Service Pointer Editor*.

POINTS TO OBSERVE IN GRUNOW SERVICE

EVAPORATOR—Frost condition and sound. It should have a uniform frost and make a noise as the gas bubbles break against the top of the evaporator.

Thermostat—Dial setting and overload switch position. The dial setting is not so important unless the complaint indicates that the dial is set wrong or is out of adjustment. Close the switch if it is open.

Compressor Unit—Temperature and sound. The unit should be rather warm but not too hot for comfort unless the room is hot. The unit should run rather quietly unless head pressure is high.

Fan—It should be running and moving the air satisfactorily.

Condenser—Air passages should be clean. The temperature of each bend should be slightly warmer that the one below it. If the condenser contains any liquid, that part of it will be at uniform temperature.

Relay—Watch its action. It should snap up and then drop back as the motor starts. The time interval and flashes will give an indication of the condition of the unit.

Suction Line as it leaves the cabinet and as it enters the compressor. It should be cool or even cold at the cabinet but if it is cold as it enters the compressor, the machine has an overcharge of gas.

Liquid Line at coupling. It should be cold and sweating or even slightly frosted.

Carrene Meter—Check the head pressure with the service kit valve and gauge.

Door Gasket—It may be that the machine is trying to refrigerate the entire room instead of the box only. *Submitted by C. L. Carter, Pueblo, Colorado.*

CONVERTING FRIGIDAIRE N & W TO METHYL

MANY service men have converted SO_2 jobs to methyl chloride especially on Model N & W Frigidaires. We know by changing the refrigerant, we increase our capacity, but on all the models difficulty is encountered in condensing methyl chloride due to the fact the volume of refrigerant is so great that the liquid level in the receiver comes up much higher than before. You will find that there is no way of condensing the hot gas as it enters the receiver. The water valve will be wide open, the liquid line will be ice cold and the upper quarter of the receiver will be hot and the machine will cut off on high head.

In order to get the full use of condenser receiver on CH_3CL you have to fasten an auxiliary receiver to the liquid line so that the liquid level is much lower in the tank allowing the hot gas to condense on the water coils or tubes as the case may be. For Model N, a surge tank from Frigidaire Freon jobs is suited admirably for this purpose. *Submitted by Frank Depagnier, City Island, N. Y.*

MURIATIC REMOVES CALCIUM

I HAD a 2 hp. brine tank system which got the brine inside of the coil and formed a sticky coating all over the inside of the compressor and stuck it up. The refrigerant was F-12. I had an awful time finding something that would remove the calcium chloride which formed the sticky substance. I tried carbon tet, alcohol, gasoline, alkali, sal soda, water, and steam with no results. I finally found that pure muriatic acid did the trick nicely.

I have often used muriatic acid for cleaning up compressors and parts that were badly carbonized or rusty but never suspected it would remove the calcium chloride

formation. Another nice thing, it does not remove the paint, or seem to damage it. I submerge the part in the acid or paint it on with a swab if the part is too large to submerge. Leave it there for from one to fifteen minutes or until it is clean, then rinse with water, then submerge the part in a solution of strong soda water for about half an hour, rinse again and blow dry with compressed air. It is important to dry the part immediately to prevent oxidation. The job finally has to be baked and dried thoroughly. Muriatic acid is inexpensive if purchased by the gallon, generally less than $1.00 a gallon. *Submitted by L. A. Eichelberger, Marshall, Mo.*

OPEN VALVE WITH TORCH

NOW that we may encounter new condensing units again, the problem of opening compressor shut-off valves without twisting off stem may arise again.

The answer is to apply flame of acetylene torch to mid-portion of flanged body to raise body temperature to about 200 degrees. Body will expand before heat reaches stem and relieve pressure of stem on seat so that stem can be turned without damage. *Submitted by W. E. Patten, Baltimore, Md.*

TURN THE HINGE OVER

THE proper replacement hinges for refrigerators are not always immediately available. If the refrigerator has double doors, this suggestion will help in making repairs.

Usually the hinges on a refrigerator wear at the bottom due to the weight of the door and finally wear down far enough to where the latch is not engaged properly and sometimes the door may scrape on the door opening. In cases where you have a two door box you can take the two hinges off the right-hand door and exchange with the two hinges on the left-hand door. This gives you a new hinge wearing surface that will at least last until new hinges are available. *Submitted by W. L. Flanders, Jr., Atlanta, Ga.*

". . . needs defrosting!"

LIBERTY

Reprinted from Liberty Magazine

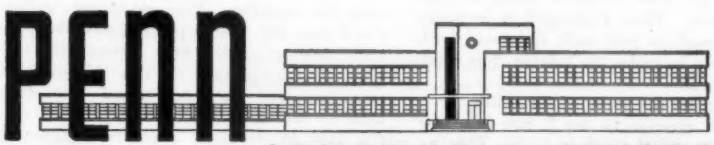
● For walk-in coolers, reach-in boxes, display cases and all "above-freezing" refrigeration jobs . . . AVRGAIRE Control assures:

1 **Extremely close regulation of box temperature without irregular short-cycling of the compressor.**

2 **Selective defrost . . . automatic defrost on each operating cycle when box load is normal . . . only partial defrost when loaded with warm produce and extra cooling capacity is required.**

3 **Uniform humidity to minimize dehydration and "sliming" losses.**

Let us send you the complete story on AVRGAIRE . . . the refrigeration control with a single-type temperature bulb so applied that the bulb is influenced by the average temperature of both coil and air! Write today for Bulletin 2250. *Penn Electric Switch Co., Goshen, Ind.* Export Division: 13 E. 40th Street, New York 16, U. S. A. In Canada: Powerlite Devices, Ltd., Toronto, Ont.



AUTOMATIC CONTROLS

FOR HEATING, REFRIGERATION, AIR CONDITIONING, ENGINES, PUMPS AND AIR COMPRESSORS

QUESTIONS AND ANSWERS

On Problems of Servicing, Installation and Maintenance of Household and Commercial Refrigerating Equipment—Send Your Problems to the Question Box.

CAPILLARY TUBE OVERSIZE

QUESTION 713: Some time ago I overhauled a Crosley refrigerator, and replaced the capillary tube with one having a .050 inside diameter. Before this unit became defective it cycled 5 minutes on and 15 minutes off. Now the best I can do with it is 15 minutes off and 15 minutes on at the lowest point. The head pressure is about normal and suction at 5 inches vacuum.

ANSWER: I believe you will find the reason you are getting a long running cycle is due to the fact that the refrigerant is passing through the capillary tube at too high a back pressure.

One means of cutting down the effective orifice is to rewind the capillary tube in a much smaller diameter coil. You may find this will correct the difficulty and bring the operation of the machine back to normal.

PERPETUAL MOTION—ALMOST

QUESTION 714: I was called to repair a Westinghouse refrigerator the other day, which has me on the spot, for it does not seem possible, so I will state this as clearly as I can, hoping you may be able to help me.

It's a Westinghouse, style 815535, Serial No. 2667178, 110 V, 3.0 A, 60 cycle.

When the machine completes the running cycle and the control cuts off, it seems to continue to rotate at a very slow speed, say (60 rpm) for at least half the off cycle (8 to 10 minutes), then it is dormant for 8 to 10 minutes before the control cuts in. As near as I can tell this slow rotation is in the direction that the unit runs. The reason I say this is that when the unit was going through the running cycle, I pulled the wall plug and the unit dropped down to this slow rotation. Then I plugged it in again and it seemed to just pick up speed with no hesitation to make me believe it is rotating backwards.

Listening to the compressor while it is rotating, it appears to me I can hear the piston-pump and the valves click. This rotation continues with the wall plug out and no current to the unit.

I do not believe it can be a valve leak for the evaporator does not defrost any on the off cycle, which it would, if the high and low side balance, and I do not see how a piston job can run backwards.

The unit runs about 5 minutes on and 15-20 minutes off, which is about normal. There is no complaint on its operation, but the noise, which at this slow rotation causes the unit to bob around on the springs and make a slight noise. The party said it has just started this.

I did not put a gauge on this for the pigtail is rather short and would have to blow the gas out and sweat on a longer pigtail, and the frost and other indications were o.k.

Hope I have made myself clear to you, and will be waiting for your reply.

ANSWER: After reading your letter several times, I am convinced that the difficulty with the Westinghouse unit lies in a leaking discharge valve which permits the gas to move the piston a slight amount every few seconds until it has reached bottom dead center.

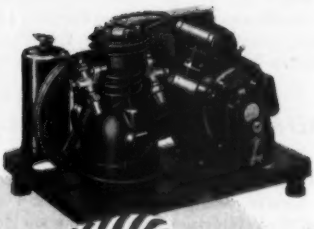
I do not believe it is possible for the pressure in the system to keep the machine running. If such were the case, the unit to which you refer closely approaches perpetual motion.

The service department of the Westinghouse Electric Corp. could offer no enlightenment on your problem. I do believe, however, that if you put the valves in good condition, you will find the unit assumes normal operation.

VALVE CAPACITY RATING

QUESTION 715: I would like to know how the proper orifice size of an expansion valve is determined for large commercial systems, such as is used in air conditioning.

ANSWER: The orifice size in an expansion valve is not necessarily the factor that governs its capacity. You, no doubt, understand that the needle must always be partially restricting the flow through the orifice. In recognition of this design fact, manufacturers have performed laboratory tests to determine the capacity of each orifice size at different pressure differences across the valve. The valve is then selected to have sufficient capacity to deliver the proper quantity of refrigerant based on the Btu capacity of the condensing unit.

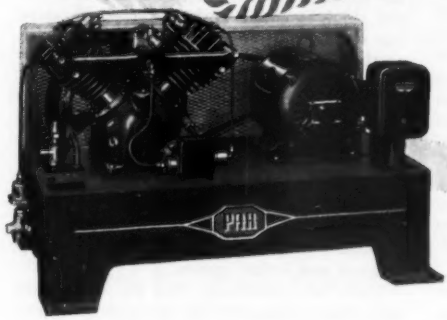


PAR Gives "BLANKET COVERAGE"

in Models and Sizes for Economical, Efficient Refrigeration

FROM 1/6 TO 5 H.P.

PAR BY Lynch



YOUR Par Jobber has Complete details on the Par line of Condensing Equipment. See him for full information or write for Par catalogue R-96 and supplement R-96A.

PAR—Condensing Unit Line sold exclusively through Franchised Refrigeration Supply Jobbers!

PAR Lynch DIVISION

. . . By Comparison — You'll Buy PAR

Manufacturing Corporation, Defiance, Ohio U. S. A.

When the Btu per hour rating of the coil or condensing unit is known, the valve is then selected to be equal to or slightly greater in capacity.

REFRIGERANT NOT IDENTIFIED BY SWITCH SETTING

QUESTION 716: Whenever I am called upon to service strange equipment and I suspect that the refrigerant might have been changed, I always check the low pressure switch settings. I compare the cut-out and cut-in pressures with the pressure temperature chart.

For example, wherever the pressures read appoximately: 9 lbs. cut-out—24 lbs. cut-in, the refrigerant is methyl. 18 lbs. cut-out—33 lbs. cut-in, the refrigerant is Freon-12. 6 in. Vac. cut-out—10 lbs. cut-in, the refrigerant is SO_2.

Let me know what you think of this system.

ANSWER: I don't think that your method of determining the refrigerant in the system would be very satisfactory because it does not take into consideration the size and kind of evaporator used in the application of the refrigerating system. In other words, the cut-in and cut-out pressure will vary from lower temperature coil to a higher temperature coil.

There will also be a variation between the blower type coil and the pipe coil or cold plate. Then, too, if the evaporator should happen to be small in relation to the size of the box being refrigerated, the operating pressures will be considerably lower than when the evaporator is large in comparison to the refrigerated space. All of these variations may make as much as ten pounds difference in the cut-out pressure. In addition, there is as much as twenty pounds variation in operating pressures from, let's say, the air conditioned system to the freezing storage system.

Thus the method of determining the refrigerant from the operating pressures couldn't be relied upon without going to a great deal more work in considering all of these varying factors. I think a much better and surer method of determining a refrigerant is first, by the odor of sulphur dioxide, then, in the case of methyl chloride or Freon, it is best to take a sample of the liquid in a small container and if upon applying a match to the vapors rising from the top they have an inclination to burn, the refrigerant is most likely methyl chloride. If they will not burn, the refrigerant is Freon. Of course, pressures will come into consideration in this test also because some of the other low pressure refrigerants will burn, but their operating pressures are so widely different from methyl that they could not be mistaken. The same holds true for Freon.

VALVE TROUBLE ON FREEZER

QUESTION 717: I have constructed a small freezer box and am having trouble with the thermostatic expansion valve. It starves the coils or floods them causing short cycling and at times long running periods. The temperature of box is also very erratic, sometimes 20 degrees and at other times 59 degrees above, although the pressure control is set to cut in at 5 lbs. and cut out at zero lbs. using Freon refrigerant.

I have tried several makes and several models of standard valves. Do I have to have a low temperature valve? I thought that the only difference between these valves was the limiting back prssure to protect the motor from overload.

At first I thought that the valves froze due to moisture so put in several large driers, but without any success.

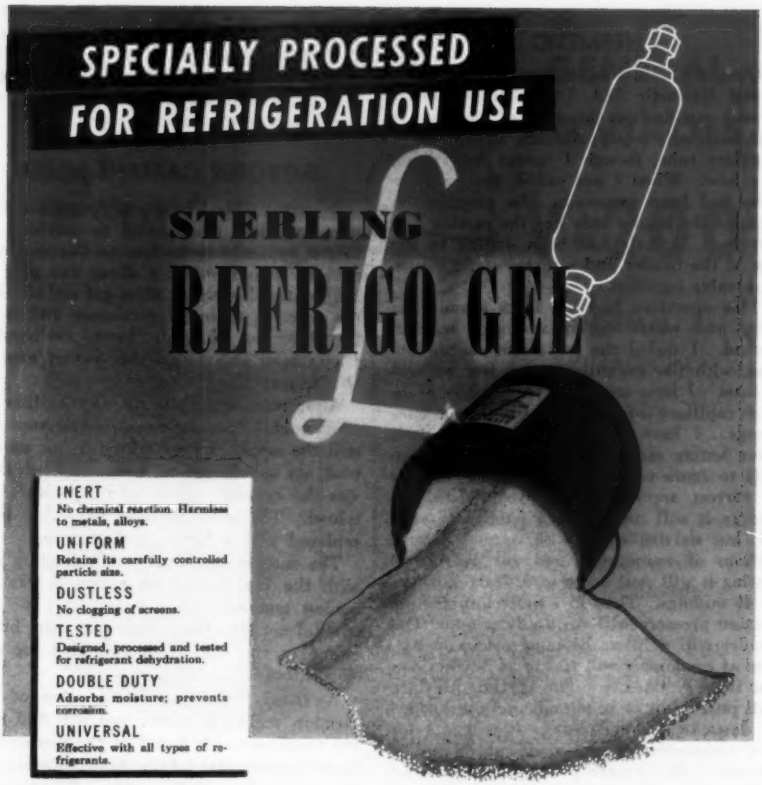
I notice that the bulb of the valve seems to get paralyzed, for as soon as it is touched by my hand, the refrigerant rushes through the coils. This valve is inside the box. Do you think it could work better if the valve was on the outside with the power element on the inside?

I have been thinking that perhaps it would be better if I used an automatic valve with a temperature control. Any information you can give me will be appreciated.

ANSWER: From the explanation you have given of the valve operation, I am not sure that moving the valve to the exterior of the cabinet would eliminate the difficulty. Expansion valves function properly in sharp freezers and locker rooms.

There is a possibility that the valves you have been using are too large for the capacity of the condensing unit. Oversize valves will cause "hunting" because they open too wide for the system and permit an excess of refrigerant to enter the coils. Another thing that may be causing trouble is that the capillary tube of the power element may be contacting a cold surface. This will cause erratic valve operation.

I would suggest you use a limit charged valve to get the most desirable operation. It is also possible to use an automatic expansion valve as you have suggested.



A SUPERIOR SILICA GEL PRODUCT

for Factory-Charged Dehydrators or Bulk Refills

● Here is the ideal drying agent for use in refrigerator plugs. It has been carefully processed from superior quality Silica Gel to meet the exacting requirements of the refrigerating industry. Acts instantly to adsorb moisture. Maintains its uniform crystal size without powdering or caking thus preventing the refrigerant from channeling. Noted for its long-term dependability and uniformity. Inquiries invited from distributors and jobbers.

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EXPANSION VALVE ON SERVEL HERMETIC

QUESTION 718: I have been working on a Servel Hermetic SE4, Unit R-IO-D. From what I can find on this type of machine, it was originally equipped with some sort of capillary tube, though I cannot learn what and how. When I was called, the capillary tube had been removed. The plug in the back of the header only had the suction line attached. A hole had been drilled in the top of the header and a thermostatic expansion valve installed.

This operation had left leaks around the plug and where expansion valve was attached. I sealed the leaks and started the unit with the expansion valve but without success. I have tried various lengths of ⅛ inch capillary tube by inserting copper wire inside. I have charged with methyl until after letting machine warm up in and outside to room temperature, and the pressure is correct according to charts. With less charge it will not get cold enough to shut off, but starting warm with normal control bottom of evaporator, and cut out in 30 setting it will pull down to 5 degrees in the to 40 minutes. Then in 7 to 10 minutes the suction pressure will rise to 35 pounds. The header will defrost, the temperature in bottom of evaporator will rise to 20 degrees and cut in very quickly. The suction pressure will pull down to 12 pounds and more slowly down to 6 pounds where it will stay for the remainder of the cycle of 30 to 40 minutes. My present hook-up being the capillary tube attached to plug in rear of header, and the suction line to hole in top of header. The way the pressure pulls down I cannot think the compressor is too inefficient, though that may be the trouble.

ANSWER: The SE-4 Servel was equipped with a filter at the outlet of the condenser. To this filter was attached a capillary tube that entered the evaporator. From your explanation, I am of the opinion that the trouble now is in the adjustment of the thermostat. The temperature at the thermostat bulb should be 14 degrees when the machine turns off. Good results should be obtained by using 5 feet 6 inches of .032 ID capillary tube. It is possible that the thermostat differential has been changed. This adjustment is a small screw at the lower end of the arm actuated by the bellows. The range adjustment is a locked screw just above the bellows at the end of the control shaft passing above the evaporator to the front.

The system is charged with one pound of methyl chloride and 380 cubic centimeters of oil. This is about one third quart. Charging should be done until the suction line frosts, then purge until about six inches of the suction line is frosted when the unit cuts off.

IMPROPER CARRENE METER

QUESTION 719: I have a top mounted Grunow unit I've been asked to service. At first it appeared to be low on Carrene, so I drained it and only got about one pint. I refilled the dryer with silica gel and checked the receiver to see if condenser and capillary were not plugged. Found no trouble. I measured and added the correct amount of refrigerant.

After running awhile the suction line became cold. I took out some refrigerant and still the same. I kept taking it out until I took out over a quart. Twenty-four degrees was the coldest evaporator temperature obtained. The small carrene meter has been replaced with a larger upright type.

The suction line finally quit frosting and with the last refrigerant removed was the coldest temperature.

I did not take the compressor apart but it seems to run o.k. Can you give me any suggestions?

ANSWER: From your description of the Grunow action, I believe you will find that the Carrene meter is not of the proper size to adequately restrict the flow of Carrene to the evaporator. After getting the evaporator cold, the expansion of the gaseous Carrene as it entered the evaporator would likely maintain the same approximate temperature as the evaporating liquid at a high back pressure.

I would suggest you check the suction pressure when the machine is frosting the evaporator. It should be from 24" to 28" vacuum if the Carrene meter is properly restricting the flow.

S S S

THEY WERE BUSY TOO

According to a survey of 250 men made in New York before the war, each man averaged 5 calls per day. Due to the loss of manpower to the armed forces and to increased calls on aging machines, the number of calls increased to 7 per day per man.

This information is contained in the article by W. A. Matheson on page 21 of this issue.

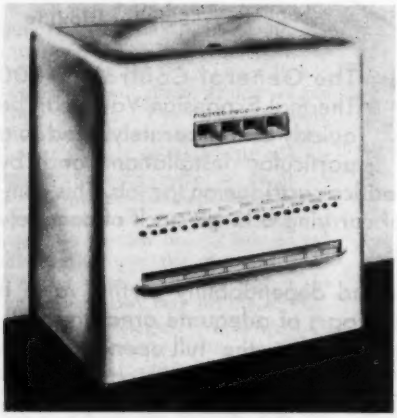
New and Improved Appliances

Frozen Food at Touch of Button

A NEW type of dispensing units, which enables housewives to wait upon themselves by pushing a button, has been announced by the Frosted Food-O-Mat Company, of Glenshaw, Pa. The new self-service case permits shoppers to select from one to twenty staple food items, which are automatically delivered to the purchaser immediately after the touch of the button.

conducted over a period of several years.

The merchandising problem disclosed by the survey indicated the need of equipment that would make shopping for frozen foods as easy as selecting packaged goods from retail shelves. By providing a display section where the actual goods may be seen, this cabinet stimulates impulse buying. Another feature of special interest to retailers is the patented air-conditioning principle, which makes unnecessary the task of de-frosting the walls of the cabinet.



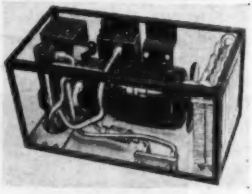
Frosted Food-O-Mat

Unlike conventional ice cream type cabinets, this new unit makes it unnecessary for customers to search for their favorite fruit or vegetable in the cold lower regions of a storage compartment. It was designed to meet the requirements of both male and female food shopping habits, as disclosed by a survey of consumers' frosted food shopping habits,

Heat Dissipating Unit

A NEW heat dissipating unit for use in television, radar, short wave radio communication, high pressure mercury lamps, x-ray tubes, induction heating unit and many similar products is announced by The Eastern Engineering Company of New Haven, Connecticut.

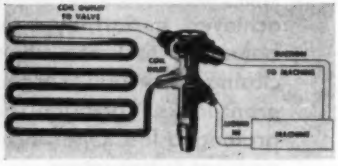
The units were originally designed for the ground, airborne and water services of the armed forces. They are now being manufactured for commercial heat dissipating applications. They are furnished complete with Thermostat control, Thermostatic valves and Flow switch. The unit shown above will dissipate up to 1200 watts with a constant controlled temperature, irrespective of surrounding temperature, within a close heat control range of 2 degrees C. This unit, size 16" x 7½" x 7½" is available in steel, bronze or alumium. Other models can be built to dissipate up to 5000 watts. Smaller models can, of course, be built where the need is for a smaller unit and the wattage is much lower.



Heat Dissipator

New Thermostatic Expansion Valve

TENNEY Engineering, Inc., Newark, N. J., manufacturers of temperature and humidity control equipment, has announced a new thermostatic expansion valve for regulating refrigerant flow into an evaporator.



Tenney Valve

The new valve, Model TS-1, is designed for standard commercial use, such as air conditioning, display cases, refrigerator boxes, etc. Other models for air conditioning

and low temperature use, each with special features, will be announced shortly.

The use of a feeler bulb is eliminated. The valve is not affected by box temperature, entering warm air, or warm suction lines. It responds instantaneously to changes in suction vapor conditions. Sizing the valve to the job, normally done to prevent "hunting," is unnecessary. There is no "hunting" due to the absence of any appreciable time lag in control, such as is usually encountered between suction line, bulb, control fluid, and valve diaphragm or bellows.

With the new Tenney Expansion valve, extremely close super heat control (such as 5° F. super heat with plus or minus ½° F. for control) can be maintained. It is particularly adaptable to modern evaporators with forced air, small tubes, short passes and distributor header combinations. It is also ideal for small evaporators or modern close coupled coil and machine combinations. It will close completely above a definite evaporative pressure.

Another outstanding feature of the new Valve, is its complete elimination of all need for special "charging" and complicated "cross-charging" to assure operation in a specific temperature range, normally included in "liquid charged" valves. No special installation is required to prevent loss of control caused by condensing of bulb control fluid in valve body, as is needed with so-called "gas charged" valves. The new Tenney Valve has all the advantages of a "gas charged" and "liquid charged" valve, with none of the disadvantages of either.

Improved Test-Lite

THE improved all-purpose Ne-O-Lite Electric Test-Lite, now retailing at a new low price of 50c, is winning praise from radiomen, electricians, maintenance men, mechanics and home owners everywhere. It is a handy, inexpensive, trouble shooter, ideal for testing electric appliances, locating blown fuses, testing A. C. Lines, and for hundreds of other uses. Glow of neon lamp instantly tells if circuit is broken. Tests voltages from 60 volts A. C. to 550 volts A. C. or D. C. by variable light intensity.

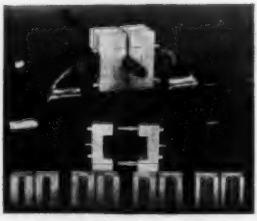
Improved construction features of the Ne-O-Lite Electric

Ne-O-Lite Test-Lite

Test-Lite include new clear plastic tip and shell, new insulated test points, and improved body design. The new model is very sensitive and requires only a small amount of current to make the neon lamp glow.

New Device Holds Small Pipe

A HANDY pipe gripping device has been designed to hold small pipe in any vise without crushing or marring



Nip-Grip

the surface or threads. Servicemen have found that thin-walled pipe in sizes from ⅛" to ½" is difficult to hold securely. This device, known as the Nip-Grip, permits fast handling of pipe without damage. It consists of two light alloy retainer blocks in which hardened steel inserts are slipped to hold various pipe sizes. ⅛", ¼", ⅜" and ½" inserts are furnished. Springs automatically spread the blocks apart when the vise is opened. It can be positioned horizontally or vertically and is held by pins. The Nip-Grip is manufactured by J. A. Campbell Company, Long Beach, Calif.

Miniature Oiler

OIL-RITE offers a new drop feed oiler for heavy duty applications which combines visibility and adjustability in a small unit.

Actual Size of Oiler

This oiler can be used wherever small capacity feeding is required. Especially suitable for very slow or medium feeds. Can be filtered, and therefore, replaces ordinary wick oilers which cannot readily be adjusted.

Oil is fed by gravity through an oil port which can be adjusted within a wide range. It can be wide open, providing a steady flow of oil, or it can be closed entirely. Thus an extremely slow drop feed is possible even with light oil. The rate of feed remains practically constant regardless of oil level. Capacity of the oilers range from ⅛ ounce to one ounce. Pipe thread sizes are ⅛" and ¼".

The construction is sturdy, consisting of two main parts. The base which is made of brass, and the reservoir which is of unbreakable plastic, making the oil supply visible and indicating when a refill is needed.

Refrigeration Service Engineers Society

Official Announcements of the activities of the International Society and Local Chapters appear in this department as well as articles pertaining to the educational work of the Society.

THE OBJECTS OF THE SOCIETY

To further the education and elevation of its members in the art and science of refrigeration engineering; for the reading and discussion of appropriate papers and lectures; the preparation and distribution among the membership of useful and practical information concerning the design, construction, operation and servicing of refrigerating machinery.

INTERNATIONAL HEADQUARTERS: 433-435 North Waller Ave., CHICAGO 44, ILL.

COMING CONVENTIONS

REMA Meetings and Convention
Spring meeting: March 4-5-6-7, 1946.
Place: Stevens Hotel, Chicago, Ill.
Joint meeting with jobbers.

All Industry Exhibition:
Place: Cleveland Public Auditorium.
City: Cleveland, Ohio.
Date: October 28-29-30-31, 1946.
Exec. Secretary: R. Kennedy Hanson, 1107 Clark Bldg., Pittsburgh, Pa.

REWA Meeting
Date: March 4-5-6, 1946.
City: Chicago, Ill.
Exec. Secretary: H. S. McCloud, 920 E. McMillan St., Cincinnati 6, Ohio.

Illinois State R.S.E.S. Board Meeting
Place: Drake Hotel.
City: Chicago, Illinois.
Date: December 13, 1945.
Secretary: Robert E. Saunders, 730 Towanda Ave., Bloomington, Illinois.

ASRE 41st Annual Meeting
Place: The Pennsylvania.
City: New York.
Date: Dec. 10-12.
Secretary: David L. Fiske, 37 West 39th St., New York, N. Y.

ASHVE 52nd Annual Meeting
Place: The Commodore.
City: New York, N. Y.
Date: January 28-30.
Secretary: A. V. Hutchinson, 51 Madison Ave., New York 10, N. Y.

H. W. Shepard,
Camp Claiborne, La.

I wish to take this opportunity to congratulate you and your staff for your splendid work in publishing the "Refrigeration Service Engineer." It is certainly an educational and "readable" publication.

WATERBURY CHAPTER CHARTER MEETING

AT A dinner meeting held in Waterbury, Connecticut, November 7th, the Waterbury Chapter received its charter presented by Clarence E. Buschkopf. There were approximately 60 in attendance including visiting members from the New Haven and Hartford Chapters. During the dinner, officers from visiting chapters were introduced and made a few remarks appropriate to the occasion.

Mr. Buschkopf extended an invitation from the New England States Association to the Waterbury Chapter to join the Association. A telegram to the same effect was read to the meeting.

S. B. Garland, International Second Vice-president, talked briefly on the advantages of membership in the Society.

Numerous prizes were given out to the attendance through a drawing of attendance tickets.

HERMAN GOLDBERG'S PARTY

HERMAN GOLDBERG'S Ninth Annual Christmas Party will be held in the main ballroom and Walton Rooms of the Drake Hotel in Chicago, Thursday evening, December 13th. Plans and arrangements have been completed to welcome over 1200 guests.

Herman Goldberg's annual parties have become recognized as an institution of the refrigeration industry and as usual, the party will be complete with entertainment, music, as well as refreshments and will have added innovations which were impossible to obtain during the war period.

Chicago hotel reservations for this affair should be made ample time in advance.

Eighth Annual Convention
Illinois State Association RSES
October 20-21, 1945

UNOFFICIALLY the Convention started on Friday evening, October 19 with a question and answer period conducted by Paul Reed, Chairman of the Wartime Educational Committee. It was a lively session attended by about 40 early arrivals lasting for nearly three hours.

Officially the Convention was called to order at 10:50 A.M. Saturday, October 20, in the Illinois Hotel. President Archie Fait of Lincoln, Illinois presided over the meeting, and in calling it to order voiced the appreciation of the meeting for the fine discussion conducted by Paul Reed on the previous evening.

In the business session that followed, minutes of the 1944 Convention were read by Secretary Robert E. Saunders and approved. The Treasurer's report was presented by John Sackey, Treasurer, and accepted by the meeting.

The roll call of delegates revealed that Tri-county, Illinois Valley, Springfield, Greater Chicago, Rockford and Corn Belt Chapters were represented by one or more delegates present.

A discussion on strengthening and improving the membership in the State of Illinois occupied some time. Then two telegrams of congratulations to the Association received from two members unable to attend the Convention were read. The first was from Willis Stafford, now in the U. S. Navy, and the other from Archie L. Robertson.

Other subjects which came up for discussion were the advisability of more advertising using the Society's name in connection with the individual's business advertising; the need for special meetings held in neighboring towns and cities by the chapters for the purpose of advancing membership and creating new chapters; the need of licensing of servicemen throughout the state, and a brief review of license laws now in force in other cities.

Saturday Afternoon

The afternoon session was devoted entirely to an educational program. The first item was a talk and demonstration by J. G. Praetz, General Service Manager of the Fountain and Cabinet Division, Liquid Carbonic Corp. Mr. Praetz's talk required nearly two hours of concentrated information on the construction, operation and service problems of Liquid Carbonic fountains. It was a most interesting presentation aided by a large number of slides and considerable equipment set up for the occasion.

Among this equipment was a glass evaporator and several large charts of the refrigerating system. Several manuals and other descriptive literature was passed out to those interested in the audience. The second feature of the afternoon was a lecture illustrated with slides covering the various types of thermostatic and automatic expansion valves manufactured by Automatic Products Corp. The talk was presented by Don Temy of Automatic Products Corp.

During the afternoon the ladies were provided with entertainment occupying the approximate time of the educational meeting.

The annual banquet got under way at 6:30 P.M. with an introduction of guests and others in the banquet hall. Approximately 170 people attended the banquet which proved to be a very enjoyable affair. The after-dinner speaker was Mr. W. A. Matheson, Vice President of the Williams Oil-O-Matic Division of the Eureka Vacuum Cleaner Company. His subject was "Why a Successful Serviceman Should Be a Good Salesman." It was a very interesting talk outlining the opportunities for selling merchandise through service for the man who is interested in selling. Entertainment was provided during the banquet in the form of accordion music played by a paid entertainer. Following the banquet, additional entertainment was provided by a master of ceremonies, utilizing members of the audience as his props and aided by the accordionist.

Sunday, October 21

The meeting was again called to order by the President, Archie Fait at 11 A.M. A roll call of retiring officers was the first order of business, with the Auditing Committee report being read last. After acceptance of the audit by the meeting, R. L. Hendrickson presented the report of the Nominating Committee. Additional nominations were received from the floor and finally when nom-

VIEWS OF THE ILLINOIS STATE ASSOCIATION 8TH ANNUAL CONVENTION, HELD IN BLOOMINGTON, ILL., OCTOBER 20-21.

Photos by Irving Alter

inations were closed, balloting in the election of officers proceeded with the following results: *President,* William C. Metcalf; *1st Vice-President,* Keith Ruyle; *2nd Vice-President,* John Sackey; *Treasurer,* Ralph Porter; *Secretary,* Robert E. Saunders; *Sergeant-At-Arms,* Floyd Lilley.

Resolutions

"Whereas, the officers have so capably carried on the business of this organization during the past year, and

Whereas, the Corn Belt Chapter and its Convention Committee, Mr. Ralph Porter have devoted so much time and effort to this Convention, therefore

Be it resolved to extend to all of them a vote of thanks.

Whereas, the Secretary of this association is required to spend his personal free time to the work of his office. Therefore, this Committee suggests the Secretary be given the sum of $25.00 as a token of his untiring efforts.

Whereas, the education and promotion of the Refrigeration Service Engineers Society is an important and fundamental phase of the Association, we suggest the appointment of an Educational and Promotional Committee to develop programs and suggest promotional means for the members of the Association and its Chapters.

Whereas, local ordinances governing Refrigeration service and installation are becoming more common, and

Whereas, these ordinances directly affect the members of this Association, therefore

Be it resolved that a Committee be appointed to work with the Local Chapters if and when such ordinances are under consideration.

Whereas, promotional work is of necessity to bring all Refrigeration men in Illinois into the R.S.E.S. and

Whereas, all Refrigeration men are not familiar with this Association's Activities and Advantages of becoming a member, therefore

Be is resolved that the Association increase its dues for Membership from 50 cents to one dollar or more and that 50 cents be set aside for the exclusive use of such promotion, at the discretion of the Officers and the Board.

Whereas, the procedure for accepting new Active Members in the State Chapters has not been as rigid as is called for in the International Constitution, we suggest that each Chapter give due consideration to the appointment of a Membership Committee."

Next came the report of the Committee on Legislation, which was read by R. L. Hen-

drickson and discussed by the meeting.

President Fait adjourned the meeting at 12:05 P.M.

Sunday Afternoon

Archie Fait in calling the meeting to order wished the new officers the best of luck in the ensuing year, and then turned the meeting over to Clarence Buschkopf, who in turn conducted the installation of new officers. A discussion followed on the selection of the 1946 Convention City with the only bid being received from J. J. Kline of Springfield, Illinois.

On the Educational Program for the afternoon, Floyd Duvall of the Dugas division of the Ansul Chemical Company presented a movie on the subject of fire prevention in shops supplementing it with a demonstration on the fire extinguishers made by the Company. This was followed by a second and third movie entitled "Frozen Foods" and "The Kitchen Diplomat." These pictures were prepared and presented by General Electric.

In the final minutes of the meeting, a vote of thanks was accorded Archie Fait for the exceptionally fine work he had done during his time as President of the State Association. Newly elected President William Metcalf then adjourned the Convention at 4 P.M.

NEW ENGLAND STATES ASSOCIATION MEET

THE meeting of the New England States Association R.S.E.S. was held Sunday, November 4th in the Hotel Sheraton in Springfield, Massachusetts.

Registration began at 11 A.M. and the business meeting opened at 12 noon with retiring President Harold L. Lambert delivering the address of welcome.

In the business conducted during the first part of the meeting, there was a report from participating chapters, a talk by Clarence E. Buschkopf, Acting International President, and the election of officers. Those elected are *President,* William E. Tierney, Worcester; *First Vice-president,* Arthur W. Andreen, Hartford; *Second Vice-president,* M. P. Handspicker, Boston; *Secretary,* Lee J. Wallace, New Haven; *Treasurer,* George Martin, Providence; and *Sergeant-at-arms,* Walter A. Quimby of Springfield.

During the course of this business meeting, the ladies enjoyed a sight-seeing trip beginning at 11:45 A.M. Dinner was served at 3 P.M., and Chester E. Borden acted as toast-

master. The principal speaker of the day, called on immediately after dinner, was George F. Taubeneck, Editor of "Air Conditioning and Refrigeration News." Mr. Taubeneck spoke on the future prospects of refrigeration and some of the new applications to be expected from it. Following Mr. Taubeneck's address, entertainment was furnished by Batiste, well-known stage and radio comedian.

Views of the Monterey Chapter Charter presentation dinner at the Pine Inn in Carmel, California, on September 22nd. W. W. Allison, International Board Member of Los Angeles was the guest of honor, who made the presentation. The upper picture shows all but two of those in attendance at the meeting. In the lower picture, from left to right are Vice-President L. E. Thomas, Secretary-Treasurer Jack Lannon, President Robert McDonald, and Sergeant-at-Arms Henry Lopez, displaying the Charter.

MIAMI CHAPTER CHARTER PRESENTATION

THE Miami Chapter Charter presentation will be held November 26th with H. T. McDermott, International Secretary, being the guest of honor for the evening who will present the charter to the newly elected officers. Several organization meetings have been held by the chapter, and there are 95 members to be included as charter members on the charter.

A banquet is being planned preceding the charter presentation.

CHAPTERS IN THE MAKING

A GROUP of 38 men in and around the City of Greensburg, Pennsylvania, have held several organization meetings to date for the purpose of forming a chapter to be known as the Greensburg Chapter. A charter application has been made. A drive is being conducted at present with the aim of securing 60 members before the charter is closed so that the 60 names may appear as charter members engrossed on it.

A group of men in Waterloo, Iowa, and neighboring towns met a few weeks ago to consider the advisability of forming a chapter to be known as Cedar Valley Chapter. Three meetings have been held to date and application for a charter has been made to the International Society R.S.E.S.

The charter is being held open until November 14th for those in the area who wish to become charter members after which time the charter will be engrossed and presented.

S S S

R.S.E.S. Chapter Notes

ATLANTA CHAPTER NO. 1

Atlanta, Ga., Oct. 26—The meeting was called to order by Carl Coffer, President of the Chapter.

During the business session, a suggestion was made that a display card showing the date and location of future meetings, be placed on the sales counter of local jobbers. It was also suggested that meeting notices be sent to all refrigeration firms in the city giving them an invitation to attend.

The educational program of the evening consisted of a movie presented through the courtesy of the Frigidaire Corporation, which was enjoyed by all. A buffet lunch was served immediately following the meeting.

MISSOURI VALLEY CHAPTER

Omaha, Neb., Oct. 25—The meeting was held in the Rome Hotel, and was called to order by President H. H. Wilke.

C. M. Doyle gave a report on information he had obtained through attendance at the International Board of Directors Meeting held in Chicago.

A suggestion was made and carried by the meeting that 5 billboards be constructed, which could be hung in wholesalers' salesrooms, and on which could be posted the

dates and programs of future Chapter meetings.

Charles Martinson, M. S. Nelson, L. N. Shaffert and R. J. Parker were elected to membership during the meeting. The next meeting date was set for November 16th.

DAYTON CHAPTER

Dayton, Ohio, Oct. 11—This meeting was held at Allied Parts with a very good attendance. The educational chairman was not present, and as a result, there was not much in the way of an educational program. The business portion of the meeting consisted of quite a lengthy discussion of City Code, and a committee set a date for their first meeting. Paul Hopper and Charles Lutz were accepted as members at this time.

Oct. 25—This meeting was held at Allied Parts with a very good attendance. The business portion consisted of discussion of making our meetings more interesting, and also a report from the Code committee. Wade Reed, Daniel Shively and George Willard Whitman were accepted as members at this time. The educational portion of the meeting consisted of movies which were very interesting and were enjoyed by all.

SAN DIEGO CHAPTER

San Diego, Calif., October 18—The October meeting was held at the meeting room in the Anderson Refrigeration Service Building and was well attended.

Four new applications for membership were read and turned over to the Membership Committee for investigation and report at the next meeting.

The Educational Committee of the evening then presented Edward Asproth, MM8/c U.S.N. Mr. Asproth who is now on duty at the Naval Repair Base here was formerly located in Minneapolis, where he was an instructor in mechanical refrigeration. He gave a very interesting talk on low temperature work and on closing answered a great many questions asked by the members present.

After the meeting all present were treated to sandwiches and drinks through the courtesy of the evening's committee, and the balance of the evening was devoted to a "bull session" and cards.

PITTSBURGH CHAPTER

Pittsburgh, Penna., Oct. 26—At the regular monthly meeting with President Harry A. Bortz presiding, the Chrysler Corporation

gave a very interesting and detailed discussion on air conditioning and refrigeration.

Mr. Charles S. Cave, in charge of Air Conditioning Application Engineering, Chrysler Corporation, Air Temp Division, Dayton, Ohio, was the first speaker. After a brief resume of early applications of air conditioning, he discussed the demands built up by war service conditions and requirements. Step by step he discussed Air Temp engineering applications with a very interesting description and discussion of the Chrysler Air Temp Auto Balance System, which gives proper indoor humidity and temperature regardless of load or outside weather variations. He also revealed an interesting feature of interest to house owners—a combination unit for heating or cooling the home-heating by reversing the system of refrigeration.

Mr. Carl W. Millson Jr., district co-ordinator of Pittsburgh, Buffalo, and Cleveland districts for Chrysler Air Temp, discussed the future of commercial refrigeration and air conditioning, and the benefit of the Chrysler Air Temp direct dealer distributor plan for the refrigeration engineer. Industry figures of postwar package equipment is answer to the volume market, and Mr. Millson displayed numerous charts during his talk.

P. J. (Pete) Cummings, District Service Representative Chrysler Air Temp, gave an interesting talk with open discussion on servicing of the Chrysler Air Temp Hermetic and Open Compressors and Air Conditioner. He stressed particularly the ease and simplicity of replacing parts or servicing of units in the field. This subject created a very lively and interesting discussion among the 110 members and visitors present. The Chrysler engineers did a wonderful job. They kept their audience interested throughout the two hour session.

INDIANAPOLIS CHAPTER

Indianapolis, Ind., Oct. 9—The Chapter met in the Veterans Room of the Athenaeum with President J. A. Salter presiding. Mr. McClure of Purdue University was presented as the speaker of the evening and gave a very interesting talk on the refrigeration and air conditioning courses offered by Purdue University.

The second speaker of the evening was Mr. Ludwig of Mueller Brass Company who gave a brief talk on the Company's present activities. Messrs. Stewart and Hammel also gave a few brief remarks on their postwar plans.

View of the annual Oil Capitol Chapter picnic held September 22nd at Chilton's farm. One hundred and two, including members and their families, attended the gathering. Host and chef of the picnic was Mr. Bill Chilton, pictured lower left in the above, at work.

TOLEDO CHAPTER

Toledo, Ohio, Oct. 10—The meeting was held in Redman's Hall with 21 members present. Following a brief business session, the educational program consisted of a question and answer period which became quite lively as the number of questions increased. A lunch was served following the meeting.

MILE HIGH CHAPTER

Denver, Col., Oct. 15—The meeting was held in the repair shops of the Public Service Company. A report was given by the entertainment committee on a program being arranged for November 16th, and Mr. Smith, chairman of the educational committee, reported on the educational program to be provided for the regular November meeting.

The speaker of the evening was Dr. Roy A. Hinderman, Vocational Training Director of Denver Public Schools. His topic was "Human Relations in the Post War Period." The talk provided some very worthwhile points and was enjoyed by those present. Refreshments were served by Mr. Burbank, after the meeting adjourned.

KANSAS CITY CHAPTER

Kansas City, Ka., Oct. 3—A brief business session preceded the educational program of

the meeting in which President Ferguson introduced Mr. Gordon Whittaker of Anderson-Stolz Corporation. Mr. Whittaker gave a very interesting lecture on the use of his Company's products in cleaning and servicing water-cooled condensers and cooling towers. Following his lecture, he answered many questions from the members in attendance.

CHICAGO CHAPTER

Chicago, Ill., Oct. 9.—The meeting was held at the Morrison Hotel and was opened at 8:45 P. M. by President Floyd Lilley. All Officers were present. The meeting was attended by a large number of members and guests.

A report was made on the Dinner Dance by Ed Riccio, Chairman of the Committee. He informed us that the Committee's replies to the inquiries from the various Hotels were not very satisfactory. The Hotels are operating at full capacity at the present time. The Morrison Hotel quoted a price of $2.75 per plate.

A motion was made by D. D. Orr that due to the Hotel complications at the present time and the amount of planning time involved that the Dinner Dance be postponed until January, 1946. The motion was seconded by Richard Henrickson, and was passed by the members.

Bills were read and a motion to pay them was made by R. Henrickson, seconded by John Heger, and passed by the members.

The meeting was then turned over to the Educational and Program Chairman, D. D. Orr, who explained the "Town Hall" meeting program.

Herman Goldberg was the Moderator for our first "Town Hall" meeting who conducted and introduced the Guest Speakers for the evening. The subject was "What of the Future?" Speakers were:

For the Manufacturers—Spike Thorndike of Detroit Lubricator.

For the Jobbers—Jack Glass, President Chicago Jobbers Associates.

For R.S.E.S.—H. T. McDermott, National Secretary of R.S.E.S.

For the Servicemen—Paul B. Reed, Manager of Refrigeration Division Perfex Corp.

The discussion was very instructive, interesting and appreciated by all present. The Door Prize was won by Mr. Friedman.

MONUMENTAL CHAPTER

Baltimore, Md., Oct. 31.—Mr. Patten turned the meeting over to Mr. Roche who introduced Mr. D. O. Eggert from the White Rodgers Electric Company. Mr. Eggert gave a very educational and interesting talk on controls. Mr. Jack Ottenheimer, chairman of the finance committee, reported on the treasury.

Ladies Auxiliary

NIAGARA FRONTIER AUXILIARY

Buffalo, N. Y., Oct. 18—The meeting was held at the Hotel Lafayette with Mrs. Orsolits presiding.

Mrs. L. McCormick was welcomed back to the area after an absence of two and one-half years, during which time she resided in Kentucky.

During the business session, the minutes of the last meeting were read and accepted, and the treasurer's report was presented. Announcement was made of a membership drive planned for the month of November.

Mrs. Muller invited the ladies to a costume Halloween party to be held in her home on October 29th.

Mr. Davis,, president of the men's organization, asked that the ladies form a committee to cooperate with the men on a Christmas Party Committee.

TRI-STATE AUXILIARY

Huntington, W. Va., Oct. 9—The greater part of the evening was devoted to business matters of the Auxiliary, and finally the discussion turned to plans for the winter months. It was suggested that a committee obtain information from different manufacturing companies on new appliances soon to appear on the market, for the purpose of furnishing information to the members. Refreshments were served to the ladies and their husbands following the close of the meeting.

KELVINATOR OF CANADA PURCHASED BY NASH-KELVINATOR CORP.

NASH-KELVINATOR Corporation has purchased Kelvinator, Ltd., English subsidiary of Kelvinator of Canada, Ltd., it was announced by H. A. Lewis, vice-president.

The purchase, for $615,000, has the two-fold purpose, Mr. Lewis said, of sharply strengthening the net working capital position of the Canadian company, while at the same time providing for expansion of the British company as a self-contained manufacturing and distributing unit.

News From— The Dispatcher

IN OUR TRAVELS around lately we have learned that ERNIE PLESSKOTT, past International President R.S.E.S. made a change recently and is now associated with Authorized Refrigeration Service Co., 1026 N. 20th Street, St. Louis—That GLEN W. DRESBACK who was formerly connected with Williams Oil-O-Matic Corp. has started his own refrigeration service company in Bloomington, Ill.—That JOHN C. McLAUGHLIN, a member of R.S.E.S. in Mankato, Minnesota, has been manufacturing a 9 cubic foot home freezer for the past three years which has proved very successful. He issued a folder on them recently and now that more materials are available, he is planning on really going to town.—Murphy and Miller, Chicago Refrigeration Service firm, has opened a branch office on Oak Park Avenue, Oak Park, Ill.—WILLIS STAFFORD, formerly from Warrenville, Ill., now in the U. S. Navy stationed at San Diego, Calif., made a flying trip to Chicago last month, picked up his car and drove back to California.

RALPH JOHN BUNDSCHUH of Webster, N. Y. has announced the opening of a commercial and household refrigeration sales and service business. Ralph has been employed at Alhart's refrigeration and electrical firm in Rochester for the past 14 years.

THE CHICO REFRIGERATION CO. of Chico, Calif. has been purchased by JESSE E. CROWE and will be changed to the Crowe Refrigeration Company. Crowe was honorably discharged from the United States Navy June 30. He held the rate of Chief Electrician's Mate and spent three years overseas. When discharged he was doing duty aboard the U.S.S. General M. M. Patrick in several ports in New Guinea, Philippines, and several other Pacific Islands.

Beside the experience he had while in the Navy he has had sixteen years experience in refrigeration and air conditioning.

ANTHONY R. NIEDZWEIGKI of San Diego, Calif. has published a certificate that he is conducting business under the firm name of Baars Refrigeration Service at San Diego, Calif.

MARVIN H. ELY and JAMES W. ELY of San Diego, Calif. have published a certificate that they are conducting business under the firm name of Ely Refrigeration Service, San Diego, Calif.

THE ORANGE BELT REFRIGERATION COMPANY, at San Bernardino, Calif. was bought on October 18 by Thomas E. Topham from George E. Adams.

KENNETH PARSONS has published a certificate that he is conducting business under the firm name of Wabash Commercial Refrigeration Service, Los Angeles, Calif.

A COMMERCIAL REFRIGERATION sales and repair building will be erected immediately at 1741 West Slauson Avenue, Los Angeles, Calif. for McCloud and DeHaan, refrigeration service engineers. It will be 30 x 80 feet in area. No information as to cost is yet available.

R. T. CAFFEE REFRIGERATION, Sales and Service, Inc. has been organized in Los Angeles with a capital of $75,000. Directors are: R. T. Caffee, Anita E. Caffee and James L. Howell, all of Los Angeles. The new corporation is represented by R. M. Roeke, 6815 Willoughby Avenue, Los Angeles, Calif.

THE BAKERSFIELD REFRIGERATION SERVICE has opened for business at 2122 Union Avenue, Bakersfield, Calif. and will handle commercial and domestic air conditioning, walk-in and freezer boxes, meat cases and refrigeration for bars, restaurants and grocery stores. An announcement by the owners, LEE HOLLEY and E. BARSOTTI says that in the domestic refrigerator field they will specialize on Frigidaire, Kelvinator, Crosley, Leonard, Montgomery-Ward and Stewart Warner or any other make with open-type unit. Lee Holley was formerly associated with the Bakersfield hardware Company for 15 years and Barsotti has operated his own refrigeration shop for the past four years.

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MELCHOIR ARMSTRONG DESSAU TO REPRESENT SUPERIOR

M. A.D. has recently been appointed as exclusive export representatives for the distribution of refrigeration valves, manifolds, fittings and accessories manufactured by Superior Valve & Fittings Co., according to W. A. Siegfried, sales manager of Superior.

M.A.D.'s experience in the export field dates back to 1899, and they are at present well represented in South Africa, South America, Scandinavia, Australia, New Zealand, Mexico, England and Continental Europe, and are continuing with the expansion of their export sales organization.

CONTROL MANUFACTURERS INCREASE PRICES

ON October 9th, 1945, the Office of Price Administration issued Order No. 48 under Section 22 of maximum Price Regulation No. 591, granting manufacturers of automatic electric controls, a price increase of 5%.

Order No. 48 states that resellers may increase their maximum prices to each class of purchaser by 5% on all items affected by the manufacturer's increase. Equipment manufacturers purchasing controls for incorporation into their products do not class as "resellers" and, therefore, are still governed by the maximum prices established for said equipment.

LYNCH APPOINTS DAVIS CHIEF ENGINEER

G. C. DAVIS has been appointed Chief Engineer of the Lynch Manufacturing Corp., Defiance, Ohio, manufacturers of Par Refrigeration Equipment. Mr. Davis will coordinate design and manufacturing efforts to facilitate a greatly expanded production program, as well as laboratory work to continuously improve the Par line of refrigeration equipment and give engineering assistance to the jobbing trade on the application of Par equipment.

G. C. DAVIS

Mr. Davis has been identified with the refrigeration industry for nearly 18 years, as service engineer, general experimental engineer and manufacturing consultant. Prior to joining Lynch he served as engineer on the manufacture of high precision war products.

STERLING SMITH WITH BAKER

WILLIAM B. WINSLOW, vice-president and general manager of Baker Ice Machine Company, announces the appointment of Sterling F. Smith as General Sales Manager. Mr. Smith will be responsible for all sales of the Baker Co. whose manufacturing facilities and general offices are located in Omaha, Nebraska.

Sales activities are conducted through a nationwide distributor organization with branch offices of the parent company in Los Angeles, California and Seattle, Washington. Baker foreign distributors are established in 63 countries.

Before becoming associated with Baker, Mr. Smith was with Mills Industries in Chicago as manager of that company's refrigeration division and prior to that time was chief of the Refrigeration and Air Conditioning Section of the War Production Board in Washington, D. C.

DEEPFREEZE APPOINTS HARLEY W. WHITMORE CHIEF ENGINEER

HARLEY W. WHITMORE has recently been appointed Chief Engineer of the Deepfreeze Division of Motor Products Corporation, North Chicago, Ill. He will be given complete responsibility for the continual development of the already prominent line of Deepfreeze Home Freezing Units and Industrial Sub-Zero Chilling Machines.

H. W. WHITMORE

Mr. Whitmore's extensive, practical experience in the refrigeration field makes him ably qualified for the job he undertakes. Prior to his joining the Deepfreeze staff he was employed for years in a similar capacity. He has been instrumental in the successful development of locker plant evaporators, freezer rooms, altitude chambers, industrial and domestic sub-zero chilling units and many other types of refrigeration equipment.

Mr. Whitmore is a graduate of the University of Wisconsin. He has a Bachelor of Science degree in Mechanical Engineering.

UNITED ELECTRIC OFFERS NEW CATALOG ON CONTROLS

UNITED Electric Controls Company, 69-71 A Street, Boston 27, Mass., has issued a new catalog and price list of controls made by the company.

The catalog contains specifications, detailed information and prices on thermostats and pressure switches of several types. It is available now from the manufacturer.

PEERLESS PRODUCING COILS, CONDENSERS AND EXPANSION VALVES

PEERLESS OF AMERICA is now engaged in putting all its facilities into production on refrigeration and air conditioning coils and various other items of refrigeration equipment.

During the war the company produced more than 6 million shells, and other items such as oxygen regulators, air diluters, and gasoline segregators.

All war contracts have been terminated and Peerless is now in production on the following refrigeration products which it made before the war: the 3-inch fin coil, flash cooler, finned and plain cube makers, capacity booster, Thermek coils, and expansion valves. New products now being readied for production include new-type unit coolers, wall-type blowers, dome-type blowers, a new kind of expansion valve, and a new kind of cold plate.

Peerless has also developed a new air-cooled condenser, which it is producing on a large scale for original equipment manufacturers only. A special conveyor-type production line was set up to produce these condensers.

Other items in the process of development will be announced at a later date, but it is very unlikely that a line of household refrigerators will be among the new products introduced.

The Peerless general sales office will be located in the company's Chicago office at 333 N. Michigan Ave., and will be headed by M. W. Knight, assistant to the president and general sales manager. Walter A. Honeychurch will be factory sales manager, handling all orders and contact with the plant operation at Marion.

S S S

ELPECO ANNOUNCES NEW DISTRIBUTION POLICY

"CAFETERIA Style" merchandising, an innovation in the commercial refrigeration field, will help simplify the distribution of ELPECO "Green Dragon" products when they start moving from the factory during the fourth quarter of this year.

M. E. Miller, President of Electric Power Equipment Corporation, explained this program in announcing the policy of distribution to be followed by his company. "It will be a strict jobber policy," he stated, "with our production channeling through selected jobber outlets, and supported by a sales and service campaign in behalf of the Independent Service Contractor."

The Self Service Plan is being inaugurated by Refrigerating and Power Specialties Co. of San Francisco, with branches in Seattle, Portland, and Tacoma, who are West Coast jobbers handling The Green Dragon Line. The Portland store has already been altered to feature the new service, and the new Tacoma store will shortly be ready. This will be entirely self-service with no counters, but only a checking-out stand. Merchandise will be on display tables and shelves.

N. W. Edwards of the Refrigerating and Power Specialties Co. has stated that the self-service program is the result of considerable study and research, and that his organization is thoroughly convinced of its success.

At the same time, ELPECO has announced a new Green Dragon item to enhance its line, known as the Thermotron. This, according to Miller, is an advanced type flow control instrument. Thermotrons will be ready for distribution in about sixty days.

Statement of the ownership, management, circulation, etc., required by the Act of Congress of August 24, 1912, and March 3, 1933, of THE REFRIGERATION SERVICE ENGINEER, published monthly at 435 North Waller Ave., Chicago 44, Ill., for October, 1945.

State of Illinois, Cook County, ss: Before me a Notary Public in and for the State and county aforesaid, personally appeared L. R. Townsley, who, having been duly sworn according to law, deposes and says that he is the Business Manager of THE REFRIGERATION SERVICE ENGINEER, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of August 24, 1912, and March 3, 1933, embodied in section 433, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Nickerson & Collins Company, Chicago, Ill.; Editor, H. T. McDermott, Oak Park, Ill.; Managing Editor, H. D. Busby, River Grove, Ill.; Business Manager, L. R. Townsley, Chicago, Ill.

2. That the owners are: Nickerson & Collins Co., Chicago, Ill.; H. T. McDermott, Oak Park, Ill.; H. T. Curtis, Chicago, Ill.; L. R. Townsley, Chicago, Ill.

3. That the known bondholders, mortgagees and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages or other securities are: There are no bondholders, mortgagees, or other security holders.

4. That the two paragraphs next above, giving the names of the owners, stockholders, and security holders, as they appear upon the books of the company but also in cases where the stockholders or security holders appear upon the books of the company as trustee or in any other fiduciary relation, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which the stockholders and security holders who do not appear upon the books of the company as trustees, hold stock and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

(Signed) L. R. TOWNSLEY.
Business Manager.

Sworn to and subscribed before me this 1st day of October, 1945. Helen G. Smith, notary public. [Seal.] (My commission expires June 21, 1948.)

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FOR SALE—Remanufactured air and water-cooled condensing units. ¼ h.p. up to 1½ h.p. Frosted food & ice cream cabinets. Edison Cooling Corp. 310 East 149th St., New York 51, N.Y.

WANTED—Sales and service company desires connection with manufacturer or distributor of home appliances; refrigerators, washers, radios, gas and electric stoves. Hursh Refrigeration & Appliance Shop, 920 Tower Ave., Superior, Wisc.

POSITION WANTED—Discharged Navy man with 4 years commercial refrigeration and air conditioning experience. Graduate of two Navy Refrigeration Schools, have two years college, business college. Thirty years old and married. Prefer Commercial Service. Will locate anywhere in U.S. Address Box NV-3, THE REFRIGERATION SERVICE ENGINEER, 435 N. Waller Ave., Chicago 44, Ill.

POSITION WANTED—Experienced installation and service engineer (15 yrs.) commercial, low temperature, domestic, desires position as factory field or local representative in field service, assembly or installation on self-contained or remote farm or home low temperature freezers. Address Box NV-2, THE REFRIGERATION SERVICE ENGINEER, 433 N. Waller Ave., Chicago 44, Ill.

COMMERCIAL APPLICATION & SERVICE ENGINEERS—Large refrigeration firm with growing export business has openings in several territories for qualified refrigeration application and service engineers. Knowledge foreign languages helpful. Write giving full details, experience and references. Address Box SP-2, The Refrigeration Service Engineer, 435 N. Waller Ave., Chicago 44, Ill.

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Help us to maintain this mutual exchange of ideas!

If you have not already done so, we suggest that you read the Service Pointers in this issue. Then sit down and let us have your own ideas. Address "Service Pointers"

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***Mr. J. M. OBERC** of J. M. Oberc, Inc., Detroit,* **says—**

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